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Understanding the roles of connection to nature, mindfulness, and distress on psychological well-being

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UNDERSTANDING THE ROLES OF CONNECTION TO NATURE, MINDFULNESS, AND DISTRESS ON PSYCHOLOGICAL WELL-BEING

by

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A plethora of research has documented the negative effects of distress on physical and psychological well-being. However, past research showed that connection to nature and mindfulness reduce distress and improve psychological well-being. Unfortunately, the processes through which mindfulness is associated to connection to nature during the recovery from distress is unknown. Understanding the aspects of how connection to nature and mindfulness independently and jointly relate to well-being increases our existing knowledge of the health benefits associated with these constructs. Therefore, the current study had three foci: (1) the relationships between connection to nature (CN), mindfulness, and distress to psychological well-being (PWB) such as depression, anxiety, positive states of mind, and life satisfaction; (2) the moderating effects of connection to nature and mindfulness on the association between distress and PWB; and (3) the mediating effects of mindfulness on the relation between CN and PWB and distress. Participants (N=276; n= 37 males, n=239 females) were undergraduate (n=273) and graduate (n=3) students from a Midwestern university. Results indicated that CN was negatively associated with distress and depression. In addition, mindful attention, mindful awareness, and mindful acceptance were positively associated with life satisfaction and positive states of mind and inversely associated with depression and distress. All mindfulness measures except mindful awareness were inversely associated with anxiety. Furthermore, mindful awareness fully mediated the associations between CN and depression and distress. Mindful

attention also fully mediated the CN-distress association. Buffering effects against the negative outcomes of distress were found in the moderation analyses. That is, mindful acceptance moderated the association between distress and PWB (depression and life satisfaction). More specifically, despite having increased distress, those with higher mindful acceptance had lower levels of depression and higher levels of life satisfaction. Lastly, CN did not moderate the association between distress and PWB. Limitations of this study and future direction for research are discussed.

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"*Adopt the pace of nature: her secret is patience*" - Emerson

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INTRODUCTION

The human-nature relationship can be considered necessary for well-being. Interaction with nature has many positive benefits for people's health, with the biophilia hypothesis (Wilson, 1984) being the primary explanatory framework for examining the association nature and well-being. The evolutionarily-based biophilia hypothesis, which posits that humans are drawn to life and lifelike processes helps to explain some of the multiple associations between exposure to nature and well-being. In research, biophilia has been measured through the operationalization of connection to nature. Scholars have started to explore the associations between contact with nature and well-being because evidence-based research has established that "...direct experience of nature plays a significant, vital, and perhaps irreplaceable role in the affective, cognitive, and evaluative development" (Kellert, 2002, p.139).

Biophilia Hypothesis

The first purpose of this study is to examine the relationship between connection to nature, which refers to an emotional affinity with nature, and psychological well-being (PWB). It is important to distinguish between nature, exposure to nature, and connection to nature when examining the research literature in order to clearly understand proposed pathways of the influence of nature on PWB. Nature refers to the physical world that includes all living things such as plants and animals, and natural elements such as bodies of water. Exposure to nature refers to spending time in a place that is characterized by many natural elements and living things. Connection to nature (CN) is a psychological construct that refers to an individual's emotional sense of oneness with nature (Mayer & Frantz, 2004). CN has been associated with overall well-being (e.g., Bowler, Buyung-Ali, Knight, & Pullin, 2010; Nisbet, Zelenski, &

Murphy, 2011; McCurdy et al., 2010; Finley, Franke, McKay, & Sims-Gould, 2015), pro-environmental behaviors (e.g., Chawla, 1999; 2007; Wells & Lekies, 2006; Vadala, Bixler, & James, 2007), and life satisfaction (e.g., Zhang, Howell, & Iyer, 2014). For this purpose of the study, only connection to nature was examined.

The biophilia hypothesis (Wilson, 1984) is overarching interdisciplinary conceptual framework for the current theoretical frameworks such as Attention Restoration Theory (ART; Kaplan, 1995) and Stress Reduction Theory (SRT; Ulrich et al., 1991), which have been used to explain as well as delineate the human-nature relationship in terms of how connection with nature may promote human well-being. The foundational ideas for the biophilia hypothesis are grounded in evolutionary-based explanations that humans have had a long-established and positive relationship with nature as it played a key role in human survival, such as providing food and shelter (Kahn, 1997). The biophilia hypothesis explains the human-nature relationship on an affective and unconscious level. For example, it argues that certain environmental aesthetics of the nature like landscapes appeals to humans because "such landscapes [...] promote a sense of emotional well-being" (Kahn, 1997, p.6). In addition, the evolutionary relationship with nature has facilitated ecological relationships with life and lifelike processes such as plants and animals (Krčmářová, 2009). Because emotional well-being is a dimension of well-being, researchers have noted that to a degree, "a lack of natural elements is a discord [and] one would expect that a closer association with nature should improve psychological health" (Grinde & Patil, 2009, p. 2334). Because other life such as plants are part of nature, scholars have established the positive effects that presence of plants has on well-being such as decreasing the numbers of self-reported days of sick leave (e.g., Bringslimark, Hartig, & Patil, 2007), reduced

levels of self-reported distress (e.g., Dijkstra, Pieterse, & Pruyn, 2008), and decreased health complaints (e.g., Fjeld, Veiersted, Sandvik, Riise, & Levy, 1998).

Dimensions of Well-being Influenced by Nature

Research has documented benefits of nature (e.g., connection to nature) for human well-being including improved attention (e.g., Martensson et al., 2009; Taylor & Kuo, 2011), decreased stress (e.g., diastolic blood pressure), shorter hospital stays and less pain medication (Ulrich, 1984), and more positive mood as a result of exposure to nature. To date, there is no single definition of well-being. However, there is consensus that well-being is multifaceted with many dimensions such as psychological, economic, physical, social, life satisfaction and other domains of satisfaction (e.g., marital or work), and quality of life. According to the Centers for Disease Control and Prevention (CDC), well-being "can be described as judging life positively and feeling good" or experience of a "positive outcome that is meaningful for people and for many sectors of society, because it tells us that people perceive that their lives are going well" (CDC, n.d.). More importantly, it is crucial to understand that well-being encompasses aspects of mental health (mind) and physical health (body). For the purpose of the study, well-being is defined as having greater positive affect and life satisfaction and lower levels of distress. This is consistent with the multidimensional nature of well-being described by the CDC (n.d.). More specifically, this study will examine how CN, mindfulness, and stressors are related to PWB as measure with positive states of mind, life satisfaction, anxiety, and depression. Two of the processes through which nature may benefit human well-being, improved attention and reduced distress, are described below. In this study, mindful attention was measured because attention is related to mindfulness as it is a key mechanism of cognitive functioning during the stress

process.

Attention Restoration Theory (ART)

Attention Restoration Theory (ART), a second evolutionary-based theory, offers additional insight to help explain the associations between nature and well-being. The theoretical conceptualization of ART proposes that human attention is comprised of two systems, directed attention and fascination (Kaplan, 1995). Directed attention is voluntary and requires more effort and focus, and therefore is prone to fatigue. Fascination is the intrinsic intrigue with nature (or other stimuli) and it requires less effort and is mentally rewarding. Engaging the fascination attention system, for example through exposure to nature, allows the directed-attention system to recover. Research evidence supports ART, particularly that exposure to nature restores directed attention and this is positively associated with well-being. Findings include improved cognitive functioning such as attention and memory (Taylor & Kuo, 2009; Berman et al., 2012; Berman, Jonides, & Kaplan, 2008), executive functioning (Schutte & Torquati, & Beattie, 2015), self-regulation (Kaplan & Berman, 2010), as well as increased positive affect for depressed individuals (Berman, Jonides, & Kaplan, 2010).

The human-nature relationship has changed dramatically in contemporary times. In 2010, the United States Census Bureau reported that over 249 million people (over 80% of the U.S. population) live in urban areas. Globally, in 2014, United Nations reported that 54% of the world's population lives in urban areas and it is projected to increase to 66% by 2050. The migration from rural to urban areas has introduced new environmental stressors such as overstimulation of traffic, noise, crowding, and technology into people's day-to-day lives. Numerous studies have found inverse associations between stressors and well-being among

adults and children. Stressors negatively impact psychological well-being (Wells & Evans, 2003; Sellers, Copeland-Linder, Martin, & Lewis, 2006), and are associated with physical health problems such as increased inflammation (Sin, Graham-Engeland, Ong, & Almeida, 2015) and diabetes-related problems (Speca, Wahlberg, Vaarala, Frodi, & Ludvigsson, 2005). Moreover, childhood exposure to stressors predict negative health-related problems later in life; for example, internalizing behaviors such as depressive symptoms (Turner & Butler, 2003), externalizing behaviors like alcohol use (Dube, 2006), increased risk of heart attacks (O'Rand & Hamil-Luker, 2005), and chronic physical conditions such as headaches and asthma (Scott et al., 2011). The research evidence presented here is important because scholars have documented the potential stress-buffering effects of connection with nature on well-being as the human-nature relationship can help build a protective factor for resilience (Chawla, Keena, Pevec, & Stanley, 2014).

Stress Reduction Theory (SRT)

Restorative environments can potentially reduce the effects of stressors on overall health and well-being. Evidence indicates that nature is a restorative environment. Stress Reduction Theory (SRT) proposes that certain environments can either restore and enhance or decrease well-being when individuals are exposed to environmental stressors. In contrast to ART, which postulates that the mechanism of restoration is improved attention and cognition, SRT proposes that the mechanism through which environments can promote or restore well-being is through increased positive affect (Berman, Jonides, & Kaplan, 2010). With this in mind, the natural environment can be used as a resource for coping; people can spend time in natural environments to improve their mood, to "clear their heads," or both.

Mindfulness

The second purpose of this study is to examine associations among: (1) connection to nature (CN) and mindfulness; (2) mindfulness and well-being; and (3) mindfulness as a mediator of the association between connection to nature and well-being. Mindfulness is a construct that is linked to CN (e.g., Barbaro & Pickett, 2016), ART (e.g., Kaplan, 2001), and stress recovery (e.g., Bränström, Kvillemo, & Moskowitz, 2012). Mindfulness is defined as one's "self-regulation of awareness towards present mental states and processes [and] a nonevaluation openness and acceptance towards moment-to-moment experiences" (Bränström, Kvillemo, Brandberg, & Moskowitz, 2010, p.151). With a Buddhist-based background, mindfulness is considered an attribute of attention (Brown & Ryan, 2003). Research evidence indicates that practices of meditation or yoga foster increased mindfulness (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008; Shelov, Suchday, & Friedberg, 2009). Mindfulness has been associated with several aspects of well-being. For example, mindfulness-based exercises yield greater levels of attention, awareness or consciousness, and self-regulation skills, which all are related to well-being (Brown & Ryan, 2003; Shapiro et al., 2008). Zhang, Howell, and Iyer (2014) found positive associations between mindfulness, life satisfaction, and self-esteem. Mindfulness-based interventions have been effective for improving symptoms of stress (e.g., Bränström, Kvillemo, Brandberg, & Moskowitz, 2010), promoting pro-environmental behaviors (e.g., Barbaro & Pickett, 2016), enhancing the quality of one's life (e.g., Nyklicek & Kuijpers, 2008), reducing perceived stress (e.g., Shapiro et al., 2008), and improving psychological symptoms (e.g., Bohlmeijer, Prenger, Taal, & Cuijpers, 2010).

The extant literature that provides evidence of the positive benefits related to connection

to nature and mindfulness frequently focuses on examining people who have experienced a type of negative event (e.g., medical illness or various stressors). It is important to make the distinction between stressors, stress, and distress. Almeida (2005) explained that stressors are internal and external demands that can occur on the levels of day-to-day experiences (e.g., demands of work), minor unexpected occurrences (e.g., argument with spouse), or major life events (e.g., moving away from home for school). Stressors are disruptions to daily life that can affect health and well-being because they present challenges that require resources to adapt or respond (i.e., psychologically and/or physically). Current resources can influence how resilient or vulnerable a person is to stressors (Almeida, 2005). Hence, the availability of resources (e.g., mastery of self or self-esteem, physical and psychological health, and social support) influences how successfully the individual can cope with stressors (Lazarus & Folkman, 1984). Moreover, in this study, it is argued that both connection to nature and mindfulness can operate as resources during the stress process. An explanation for this contention is provided in the literature review.

Stress Process

The third purpose of this study is to examine: (1) how connection to nature and mindfulness relate to stress; (2) whether connection to nature and mindfulness moderate the association between stress and PWB; and (3) how stress is associated with PWB. Stress is a process that includes multiple components. The stress process begins with an experience of stressors, which are potentially disruptive events. Then, the person perceives and appraises the severity of the stressor(s) and the disruptions it imposes on daily life or obligations (Lazarus & Folkman, 1984). Next, the person chooses to enact strategies to cope with the stressors and associated emotions, and then evaluates the effectiveness of the coping strategies used. The

outcomes of this process range on a continuum from distress to adaptation. Distress is a negative subjective response to stressors. The level of distress experienced by a person depends on their subjective appraisals and perception of the severity of the stressors (Lazarus & Folkman, 1984).

The Current Study

Both mindfulness and CN have been associated with decreased distress or improved PWB. Unfortunately, little is known about how mindfulness and CN moderate distress and associated stress processes such as appraisal and coping. Further, few studies have examined mindfulness, CN, and PWB simultaneously. Therefore, it is important to examine how mindfulness and CN are associated with PWB, independently and jointly, because we want to understand how each construct influences people's vulnerability or ability to recover from stress.

Stressful events can impact overall well-being, and both connection to nature and mindfulness promote PWB. However, the gap in the literature lies in the lack of evidence illuminating the role of mindfulness in the restorative processes associated with nature. Therefore, research is needed to understand how the process of stress, connection to nature, and mindfulness operate together to improve PWB. By clearly understanding the role of each construct and how they work together, we can better identify their specific contribution to improving PWB. New knowledge from our study will also inform our current theoretical as well as conceptual understanding of what is necessary to promote positive physical and mental health and prevent poor health-related outcomes. The following are the aims and hypotheses of this study.

Aim 1: Replicate previous research indicating that CN and mindfulness are positively associated with positive indices of PWB and inversely associated with negative

indicators of PWB, including stressors. Stressors are positively associated with negative indices of PWB but negatively associated with positive indices. All hypotheses will be tested using correlations.

H1: CN will be positively correlated with life satisfaction and positive states of mind but negatively correlated with distress, anxiety, and depression.

H2: Mindfulness will be correlated with life satisfaction and positive states of mind but negatively correlated with distress, anxiety, and depression.

H3: Distress will be inversely associated with positive states of mind and life satisfaction but positively associated with depression and anxiety.

Aim 2: Determine whether mindfulness mediates the association between CN and PWB & stress. This aim will be tested using both path analysis and multiple regression.

H4: Mindfulness will mediate the association between CN and PWB and distress.

Aim 3: Determine whether mindfulness moderates the association between distress and PWB and whether CN moderates the association between distress and PWB. This aim will be tested using multiple regression.

H5: CN will moderate the association between distress and PWB

H6: Mindfulness will moderate the association between distress and PWB.

LITERATURE REVIEW

Overview

This literature review begins by explaining the biophilia hypothesis, an umbrella concept that is a key to understanding the other theoretical frameworks included in this study. Following that, connection to nature (CN), mindfulness, and the associations between CN, mindfulness, and PWB will each be reviewed. In addition, a review of literature on stress theories, nature and mindfulness as moderators, and stress reduction theory (SRT) will be explored. Finally, a conceptual framework that integrates the biophilia hypothesis, nature and well-being, ART, CN, SRT, and how these frameworks relate to the construct of mindfulness will be presented.

Attention Restoration

Past studies from multiple fields of research have provided empirical support for the Attention Restoration Theory. Specifically, researchers have demonstrated that nature is a positive environment for restoring the directed-attention system, which in turn, enhances PWB. A great deal of research examining restorative properties of nature has used a 3-phase design. The first phase is a task to fatigue the participants, the second phase is the experimental manipulation of restorative or non-restorative environments, and the third phase is an assessment of restoration, such as measures of attention and mood. The rationale for the fatigue task is based on the assumption that participants would be more sensitive to the restorative impacts of the nature if they were fatigued. Using this paradigm, Berman, Jonides, and Kaplan (2010) conducted two within-group experiments that examined attention restoration and stress reduction. In Experiment 1, 28 young adults completed the Positive and Negative Affect Schedule (Watson et al., 1988) to evaluate their mood and the backward digit span to access

attention. Berman and colleagues (2010) fatigued the participants' directed-attention with a task comprised of 144 trials, which lasted 35 minutes. Participants were then randomly assigned to complete either a 50- to 55-minute nature (arboretum) or urban walk (downtown). Before and after their walk, participants completed the Positive and Negative Affect Schedule and the backward digit span again. One week later, participants returned and completed the same Positive and Negative Affect Schedule and the backward digit span measures and the walk they did not complete the previous week. Berman and colleagues (2010) reported that participants' scores on the backward digit span again and Positive and Negative Affect Schedule were significantly better after the walk through nature in comparison to the urban walk. Results provide evidence that both mood and cognitive functioning improved after the nature walk.

In Experiment 2, Berman and colleagues (2010) used the backward digit span and Positive and Negative Affect Schedule to replicate their results. In addition, the Attention Network Test (Fan et al., 2002) was used to examine three types of attentional functioning: alerting, orienting, and executive attention. Twelve young adults participated in a within-group experimental study in which they were randomly assigned to view pictures of nature or urban environments. Participants completed the backward digit span, Positive and Negative Affect Schedule, and Attention Network Test before and after viewing the pictures for 10 minutes. Each picture was shown for seven seconds. One week later, participants returned to complete the same procedure but viewed the other set of pictures. Results supported hypothesis that participants would perform better on the backward digit span after viewing the set of nature pictures than after seeing the urban pictures replicating the results from Experiment 1.

Researchers also examined the effects of nature on major depressive disorder (Berman et

al., 2012). Twenty young adults (12 females and 8 males) were randomly assigned to either a 50- to 55-minute nature (arboretum) or urban walk (downtown). Researchers assessed mood using the Positive and Negative Affect Schedule (Watson et al., 1988) and the backward digit span before and after the walk. Berman et al. (2012) found that participants on the nature walk reported greater levels of positive affect and performed better on the backward digit span than their counterparts on the urban walk. However, mood was not correlated with the backward digit span task. Moreover, although increasing positive affect is crucial for people with major depressive disorders because the disorder is characterized by low levels of positive affect, researchers theorized that lack of significant association between mood and working memory may suggest two things: (1) the improvements of affect and cognition are not always related and (2) the cognitive benefits and processes associated with the interactions with nature are not dependent on increasing positive affect (Berman et al., 2012).

Research has also shown the positive benefits of nature among elderly samples. A recent qualitative and longitudinal study by Finlay, Franke, McKay, and Sims-Gould (2015) examined the impacts of therapeutic landscapes such as blue spaces (water) or green spaces (plants, trees, and grass) on older adults' well-being over one year. At Time 1, researchers conducted 60-90 minute semi-structured interviews with twenty participants (65 years or older) with an additional 15-minute walking interview. The walking interviews functioned as a tool to examine the participant's "physical, mental, social, and spiritual dimensions of space and place" in relation to their well-being (Finlay et al., 2015, p. 98). At Time 2 one year later, only 19 participants from 2012 were able to participate in the follow-up study. Interview protocols were the same as in 2012. Finlay and colleagues' (2015) emerging themes concluded that participants were

motivated to seek out nature for physical activities (e.g., walk). Mentally, participants felt rejuvenated and restored when exposed to the natural world. Further, depending on the blue or green spaces, there were some personal ties to the particular landscapes, which offered a space for reflection and a sense of tranquility. Nature also provided opportunities for social interactions in parks or gardens.

As previous studies have documented, experiences with nature encompass many benefits. Empirical evidence demonstrates that both direct exposure to nature (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009) or viewing nature through a window (Tennessen & Cimprich, 1995; Kaplan, 2001) or photos (Berto, 2005) is associated with improvement in various dimensions of well-being. Further, Kuo (2013) concluded that any amount or dosage of nature is positively beneficial to overall well-being, with the understanding that the greener the exposure, the better the outcomes.

Connection to Nature

According to Mayer and Frantz (2004), connectedness to nature (CN) refers to feelings of oneness with nature. CN is conceptualized as an affective affiliation to the natural world. A mounting body of literature demonstrates that CN improves well-being, including: life satisfaction (Zhang, Howell, & Iyer, 2014); emotional and psychological well-being (Windhorst & Williams, 2015); psychological restoration (Hug et al., 2009); positive affect (Loureiro & Veloso, 2015); and pro-environmental behaviors (Chawla, 1999; 2007; Vadala, Bixler, & James, 2007; Wells & Lekies, 2006).

There are many dimensions of well-being such as social, psychological, or physical. Windhorst and Williams (2015) evaluated the association between mental health, a measure of

well-being, and connection to nature using a mixed-methods approach. Participants rated their overall positive childhood experience with nature on a 5-point Likert scale, reported their mental health status, and completed a measure that provided a visual representation that illustrated their relationship with nature. A subsample from the quantitative portion participated in the qualitative phase of this study.

The quantitative phase of the study revealed that connection to nature was correlated with emotional and PWB as well as positive childhood experiences with nature. Through thematic analysis of the qualitative data, researchers reported that participants who scored high on the Nature Relatedness Scale (NR-6; Nisbet & Zelenski, 2013) measure also shared positive childhood memories associated with family experiences in nature. Results from Windhorst and Williams (2015) provide evidence of the association between connection to nature and well-being but also emphasizes that positive childhood experiences in nature are associated with a connection to nature in adulthood.

Studies have examined the relationship between connection with nature and PWB through life satisfaction and self-esteem. Although much of the existing research on connection to nature focuses on the physical engagement with nature, Zhang and colleagues (2014) extended from this operationalization of connection to nature by choosing to look at connection with nature along with engagement with nature's beauty. This is, because it can be argued that engagement with nature is a way of assessing the connection to nature as well as the openness to the recovery process that nature has on PWB. Moreover, because the biophilia hypothesis is rooted in evolutionarily historical context, our ability to appreciate and experience the beauty of the natural world contributed to our probability of survival because beautiful environments

represented safety as well as signifying availability of key resources such as water or a nourishing food source. Therefore, Zhang and colleagues (2014) used a measure of engagement of nature's beauty and found positive correlations between connectedness to nature and life satisfaction and perception of nature's beauty. Participants who exhibited higher levels of connectedness with nature had higher levels of life satisfaction, demonstrating the possible impact that connectedness to nature has on individual's PWB.

In a second study, Zhang et al. (2014) examined associations between participants' engagement with nature's beauty to self-esteem, and hypothesized that individuals have the innate tendency to be emotionally aroused by their engagement in "nature's beauty" (p.57). Zhang et al. (2014) investigated the relation between connectedness to nature and self-esteem in a sample of American college students, controlling for social desirability. Connectedness to nature and perceived nature's beauty were positively correlated with self-esteem. Using two different measures of PWB these studies demonstrate associations between connection to nature, perceptions of beauty, and PWB.

Because contact with nature may be experienced under different situations such as for leisure purposes or work (e.g., outdoor recreation instructors), Loureiro and Veloso (2014) explored the associations between contact with nature during leisure activities and CN have to PWB. Researchers were interested in whether physical exercise taking place outdoors is related to PWB. Therefore, Loureiro and Veloso (2014) surveyed Portuguese who exercise either in an outdoors/indoors setting or indoors only. Results indicated that participants who engaged in physical exercise outdoors/indoors had greater levels of positive affect and PWB than those who only exercised indoors. CN was significantly greater for the outdoor/indoor exercise group

compared to the indoor only group. Further, outdoor/indoor participants reported greater levels of PWB and CN and lower levels of psychological distress than the indoor group.

Mindfulness

Mindfulness is an attention-related construct that refers to present-centered awareness and nonjudgmental approach to the current moment (Kabat-Zinn, 1992). Mindfulness is a process of self-regulating attention that can be fostered through activities such as yoga or meditation (Kabat-Zinn, 1990). Extant research indicates that mindfulness is positively associated with PWB. Practices that are intended to facilitate awareness or reflection have been used in mindfulness interventions. For example, Bränström, Kvillemo, Brandberg, and Moskowitz (2010) conducted a randomized control study. Researchers randomized cancer patients to either the mindfulness intervention or 6-months wait-list control group. Bränström and colleagues (2010) reported that compared to baseline score, at the 3-month follow-up, the intervention group had greater reduction in distress and an increase in positive states of mind and mindfulness compared to the wait-list group. The intervention group also had higher change scores across all measures than the waitlist control group. Further, researchers examined the mediating effects of change in mindfulness scores on the association between the intervention effect on the assigned group (intervention/wait-list) on positive states of mind and distress. Bränström and colleagues (2010) reported that there was full mediation which suggests that the mindfulness intervention is related to positive states of mind and distress through increased mindfulness. Similar mediating results were also reported in Nyklicek and Kuijpers (2008). These results are significant because it demonstrates that mindfulness can be fostered in an intervention format and is effective for enhancing PWB in populations such as cancer patients.

Mindfulness-based interventions have also demonstrated benefits for people experiencing stressors such as illness. For example, patients experiencing a medical condition such as cancer (e.g., Branstrom et al., 2010; 2012) or chronic lower back pain (Morone, Lynch, Greco, Tindle, & Weiner, 2008) reported benefits such as pain reduction, improved sleep and attention, and positive affect. Similarly, patients experiencing heart disease reported a reduction in anxiety levels after participating in a mindfulness-based intervention (Tacon, McComb, Caldera, & Randolph, 2003). Moreover, participants suffering from fibromyalgia reported reduced depressive symptoms after completing an MBSR intervention (Septon et al., 2007). Positive associations between mindfulness and well-being have also been reported in qualitative studies. Mackenzie, Carlson, Munoz, and Speca (2007) and Shonin, Van Gordon, and Griffiths (2013) interviewed a sample of individuals who were experiencing a medical condition (e.g., cancer or chronic lower back pain). Both studies revealed a moderate effect of the mindfulness intervention program in improving the participants' PWB.

Connection to Nature and Mindfulness

The biophilia hypothesis explains the importance of the human-nature relationship, and the construct of CN can be considered an operationalization of biophilia. Extant research found that mindfulness is related to connection to nature because of its influence on attentional capacity (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009). Barbaro and Pickett (2016) conducted two studies and investigated mediating effects of connectedness to nature on mindfulness and pro-environmental behaviors. In Study 1, results revealed that mindfulness was positively associated with connectedness to nature and pro-environmental behaviors. From the mediation analysis, there was an indirect effect of mindfulness on pro-environmental behaviors through

CN. In relation to the biophilia hypothesis, this means that over time when individuals feel more mindful about the natural world, they become more connected to nature which can be demonstrated through their behavioral regulation (e.g., pro-environmental behavior). Further, when mindfulness was statistically controlled, the relation between connectedness to nature and pro-environmental behaviors remained significant. Results from the second study (Barbaro & Pickett, 2016) revealed that mindfulness was significantly associated with pro-environmental behaviors, and CN was significantly associated with pro-environmental behavior when mindfulness was statistically controlled. Taken together, results of these two studies demonstrate that mindfulness can facilitate CN. However, more exploration is needed about how mindfulness and CN work together on a cognitive level.

Associations Between CN, Mindfulness, and Well-Being

Evidence has documented positive associations between connection to nature and mindfulness (e.g., Wolsko and Lindberg, 2013; Richardson & Hallam, 2013). However, an important question remains: does connection to nature foster mindfulness, and if so, how? Mindfulness and connection to nature have both been associated with reduced distress or improved PWB. Yet, only a few studies have examined connection to nature, mindfulness, and PWB together in a single study (Howell, Dopko, Passmore, & Buro, 2011; Wolsko & Lindberg, 2013). Wolsko and Lindberg (2013) examined the relations between mindfulness, connectedness to nature, and PWB (e.g., flourishing, positive/negative emotions, and subjective vitality). In both Study 1 and 2, results showed the following association: (1) a positively significant association between CN and mindfulness and (2) CN and mindfulness were positively and significantly correlated with positive indicators of PWB (e.g., positive emotions, flourishing, and

subjective vitality) and inversely associated with negative emotions. In Study 2, Wolsko and Lindberg (2013) also measured CN by assessing: (1) appreciation for outdoor recreation (numbers of days participants participated in activities such as hiking, backpacking, cross-country skiing or snowshoeing, and non-motorized boating; (2) engagement in outdoor activities (the number of days per year participants engage in hunting or fishing); and (3) motorized outdoor activities (motorized boating). Researchers reported that appreciation for outdoor recreation was positively and significantly correlated with CN, mindfulness, subjective vitality, positive emotions, flourishing, engagement in outdoor activities, and motorized outdoor activities, but was inversely associated with negative emotions. Because engagement in outdoor activities and motorized activities were not correlated with CN in Study 2, Wolsko and Lindberg (2013) conducted a third study to specifically focus on the relationship between CN and outdoor recreation. In Study 3, researchers reported there were significant associations between appreciation for outdoor activities and motorized outdoor activities with CN. More specifically, those who reported having greater CN also reported having greater appreciation for outdoor activities and engaged less frequently in motorized outdoor recreation. These results are significant because this study is one of few that measured CN through the pattern and frequencies of engagement and consumption of outdoor activities. Moreover, Wolsko and Lindberg (2013) provided evidence of the association between nature and mindfulness as well as the link between mindfulness and PWB (e.g., positive emotions). Because few studies have analyzed mindfulness, connection to nature, and well-being together in a single study, the proposed study aims to examine independent and combined associations between mindfulness, CN, and PWB and the processes underlying these connections.

Like Wolsko and Lindberg (2013), Howell and colleagues (2011) also examined CN, mindfulness, and PWB in a single study. In Study 1, researchers also found that CN was correlated with social well-being and PWB. However, Howell et al. (2011) did not find a significant association between CN and mindfulness or emotional well-being. The results from this study contradict results of previous studies that found positive associations between connection to nature, mindfulness, and well-being (Wolsko and Lindberg, 2013). Howell and colleagues (2011) hypothesized that the reason connectedness to nature was not correlated with emotional well-being may be because the measure of well-being focused on feeling good, while measures of well-being used in other research emphasized psychological processes or satisfaction with life. Unlike Howell et al. (2011), Wolsko and Lindberg (2013) found positive correlations between connectedness to nature and mindfulness to various dimensions that contribute to psychological well-being.

Because CN and mindfulness were not correlated as Howell et al. (2011) predicted, they conducted a second study and administered multiple measures for each construct (CN, mindfulness, PWB) to test these associations. Results from Study 2 indicated that all the mindfulness measures were positively correlated with all CN and PWB measures. Moreover, CN was significantly associated with all PWB measures. Results from Howell et al. (2011) demonstrate the importance of administering multiple measures to better understand complex constructs such as CN and mindfulness because a single measure may not delineate their complexities.

Stress Theories

Lazarus and Folkman (1984) described stress as a person-environment interaction

process: psychological stress is “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus & Folkman, 1984, p. 19). Stress processes mediate the relationship between a person and their environment (Lazarus & Folkman, 1984). Stress involves psychological processes of cognitive appraisal, emotions, and coping with stressors.

Cognitive appraisal. Cognitive appraisal is a process whereby a person evaluates a stressor by examining what characteristics or factors make the person-environment relationship stressful. Cognitive appraisal processes have two stages: primary and secondary appraisal. Both stages entail a subjective evaluation of whether and how the stressor may affect the person’s well-being (primary appraisal) as well as an assessment of personal resources (secondary appraisal) to adequately manage the stressors.

Primary appraisal. Primary appraisal involves assessing the meaning of a stressor and the impact it may have. Primary appraisal includes three possible assessments of stressor meaning: (1) irrelevant; (2) benign-positive; (3) stressful. If a stressor is appraised as irrelevant, the person has concluded that the stressor is not a threat to their well-being. Lazarus & Folkman (1984) explain that benign-positive is when the person considers their encounter with the environment to be positive. For example, if there is a snow storm, a person may not appraise the event as negative because school is cancelled because of the weather. Positive person-environment interactions are commonly associated with pleasant emotions such as love, joy, or happiness. The last primary appraisal category is stressful, and consists of three types: (1) harm or loss; (2) threat; (3) challenge. Harm or loss refers to the appraisal of negative consequences experienced by the person in relation to the stressor such as a depletion of self-esteem. Appraisal

of threat involves anticipating unwanted outcomes associated with the stressor. Threat is commonly associated with negative emotions such as anxiety or fear. Lastly, challenge is related to positive emotions because the person considers the stressor to offer potential gains or opportunities for growth. Therefore, it is possible for a stressor to simultaneously be appraised as involving 2 or 3 levels.

Secondary appraisal. Secondary appraisal is an assessment of the resources needed to successfully cope with the stressors. During this stage, the person evaluates their personal resources to cope with the stressor, what resources are needed to successfully cope, and their efficacy to cope successfully. Outcome expectancy is the person's examination of possible outcomes based on their coping options. Efficacy expectancy refers to the person's belief that they can effectively perform the actions needed to successfully cope with the stressor. It is important to note that secondary appraisal occurs simultaneously with primary appraisal. For example, when encountering the stressor, if the person recognizes that they do not have the personal resources or efficacy to successfully manage the stressors, then the outcome may be appraised as involving greater harm or loss (Lazarus & Folkman, 1984, p.35).

Coping. Lazarus & Folkman (1984) defined coping as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p.141). The coping process relates to the management of demands related to the person-environment relationship as well as the emotions associated with stressors (Lazarus & Folkman, 1984, p.19). The process of coping consists of three aspects which will be discussed below.

Lazarus and Folkman (1984) conceptualized coping as a process rather than a trait. The

process begins with the appraisal of stressors. The first step involves appraisal of the stressor as described above. Second, the person evaluates their available resources, the context of the stressors, and the possible outcomes. This means that the person needs to know what they are coping with, or what kind of stressor they are encountering because different stressors call for different coping strategies (Lazarus & Folkman, 1984). Next, the person selects and enacts a coping strategy. It is important to understand that when we are talking about a process, we are referring to the dynamic in coping behaviors and thoughts about the stressor. Appraisal and re-appraisal can occur as an individual evaluates the effectiveness of coping behaviors, and alternative coping behaviors can be chosen. Therefore, as the person-environment changes, so will the coping behaviors and thoughts. Like the appraisal process, the coping process is continuous wherein any changes in the environment or stressors will stimulate additional reappraisal, observation, and reevaluation of the stressors and coping strategies (Lazarus & Folkman, 1984, p.143).

Lazarus and Folkman (1984) differentiate between two forms of coping: emotion-focused and problem-focused. Emotion-focused coping includes cognitive processes which are intended to reduce the emotional distress the person is experiencing from the stressor (Lazarus & Folkman, 1984). Some emotional-focused coping strategies include: distancing, positive comparison, avoidance, and minimization. Problem-focused coping strategies directly address the stressor(s) such as defining the problem, developing alternative solutions, considering the pros and cons, selecting a strategy, and executing it. Emotion-focused and problem-focused coping strategies can also be deployed simultaneously. According to Lazarus & Folkman (1984), coping strategies depend strongly on available resources. These resources may include good

health, energy, positive beliefs, problem-solving skills, social skills, strong social support, and material resources. However, it is important to note that a person may have the resources to cope with the stressor but various constraints may limit their ability to do so. Different forms of constraints may make it difficult to utilize their resources or the use of the resources may create additional problems or distress. For example, personal constraints that are related to cultural values or beliefs may inhibit the use of personal resources to cope such as the use of mental health services is associated with stigma within various cultures (Lazarus & Folkman, 1984).

Coping is a dynamic process that involves appraisals of stressors as well as resources. Hence, having adequate resources during the appraisal and coping process will result in better outcomes when faced with stressors. There are two potential resources of interest for the present study: nature and mindfulness. These two constructs may be considered coping resources because they support attentional capacity, which is key to successful coping.

Connection to Nature as a Moderator

Coping with stressors requires cognitive resources during both the appraisal and coping processes. Kaplan and Berman (2010) noted that resource "implies that there is something in the system that is finite in quantity and depleted by heavy demands" (p.43). Attention is such a resource. Nature has the ability to restore attention, which is related to cognitive functioning. For example, empirical evidence indicates that spending time in nature can help with the recovery of mental fatigue (Faber Taylor & Kuo, 2011; 2009; Martensson et al., 2009) and increases cognitive resources (Chawla, Keena, Pevec, and Stanley, 2014). Because nature can restore attention, which functions as a resource for cognitive processing, people can better manage and cope with stressors. For example, Faber Taylor and Kuo (2009) conducted a within groups

design and examined the restorative effects of natural environments on attention in children who were clinically diagnosed with attention deficit/hyperactivity disorder (ADHD). Children were between the ages of 7 to 12 years old.

Researchers had each child, individually, participate in three walks, with each walk in a different environment: (1) urban park, (2) downtown, and (3) residential area. In this study, the urban park environment had more nature than the downtown and residential environments. Children participated in walks in all three environments. However, the order of the walks was randomized for each child. To be consistent, each 2-minute walk took place on the same time and day of the week and prior to the children receiving their ADHD medication. Because this study examined the restorative potential of certain environments on attention, prior to each walk, researchers mentally fatigued the children by having them complete a series of puzzles. Then, after each walk, children completed the digit span backwards test and additional measures of children's attentional capacities and inhibitory control. Children were also asked to rate their description of each walk (e.g., relaxing, scary, or boring).

Analyses compared children's attentional levels across three environments and indicated that there were no significant differences between the two less natural environments (residential and downtown) on children's concentration scores (digit span backward). However, concentration scores were significantly higher after the urban park walk compared to scores after both the residential and downtown walk. In sum, children's concentration improved after walking in a more natural environment (urban park) than walking in residential or downtown environments that had less natural settings. These results are significant because they offer support to ART as natural environments are effective for facilitating the restoration process for

cognitive resources such as attention.

Nature can operate as a resource to help buffer the relationship between stressors and PWB. In a recent study, Chawla, Keena, Pevec, and Stanley (2014) explored the potential of green schoolyards for reducing stress and increasing "protective factors for resilience among children and adolescents" (p. 1). The sample included elementary school children who played in a wooded area during recess, elementary school children who used a naturalized area for science and writing lessons, and high school students who were involved in gardening.

Chawla and colleagues (2014) collected observations and interviews from children, their parents, teachers, and staff and administrators at the schools about their perceptions regarding the green schoolyards. Results from the study indicated that elementary students who interacted with nature during recess saw the green schoolyard environment as a place that afforded them the opportunities to "be their own self," that nature supported social connections, and nature provided them with an environment to be creative, such as using loose parts from nature like sticks, rocks, and leaves to build forts. In addition, the natural environment gave children chances to gain competence and demonstrate cooperation skills (Chawla et al., 2014, p.6). Interviews from the parents revealed that the natural environment allowed their children to develop "physical and social competence," explore freely, and be able to move away from any expectations adults may have of them (p.7). In particular, children with learning disabilities like dyslexia were able to be in an environment that was easy to navigate and afforded them the opportunities to develop skills (Chawla et al., 2014). Moreover, older elementary students reported that nature was a positive buffer from stressors that have been commonly associated with classroom settings. Some students reported that natural habitat was calming and peaceful

compared to the stress of the school environment resulting from demands such as exams or homework.

High school students reported that the gardening process gave them opportunities to experience fresh air, connect with the living things, and a chance to care for the plants. The processes involved in gardening helped promote a sense of calmness and peace for the students. Overall, whether children's interaction with nature occurred during recess or for learning purposes, a common theme was that nature allowed children to engage freely, promoted well-being, and afforded them opportunities to develop different skills and other positive experiences. The positive human-nature interactions may help counter some of the negative stressors students experienced from different environments, with nature being a coping resource.

Extant studies have investigated the role of nature in buffering stressors among urban and rural children (Wells & Evans, 2003). For example, Corraliza, Collado, and Bethelmy (2012) explored the effects of nature on urban children. Corraliza and colleagues (2012) assessed early adolescents' perceptions of their stress levels, amount of nature they perceived around them, and exposure to adversity. Corraliza et al. (2012) reported that perceived distress (stress) was related to the number of stressful events the adolescent experienced. Moreover, children's perception of the amount of nearby nature buffered the association between stressful events and perceived distress. This means that children experiencing greater contact with natural environments had lower perceived distress because the nature moderated the effects stressful events have on perceived distress.

Researchers have documented how nature can buffer against the detrimental effects stressors have on PWB because natural elements have stress-reducing properties (e.g., water or

plants). For example, Van den Berg, Maas, Verheij, and Groenewegen (2010) examined the impacts of green spaces for buffering stressors among Dutch adults and reported that stressful life events were significantly related to ratings of physical and mental health. Those who had recently experienced a stressful life event also had poorer mental health outcomes. In addition, the amount of green space surrounding the participant's home was related to stressful life events and health complaints. Participants living in greener environments reported fewer health complaints associated with the stressor than participants living in lower green space, suggesting that there was a moderating effect as green space buffers the association between stress and PWB. Findings from Chawla and colleagues (2014), Corraliza and colleagues (2012), and Van den Berg and colleagues (2010) demonstrate that nature can function as a resource to help people cope with the stressful events in their lives because nature operated as a moderator in the relationship between stressors and PWB. When it comes to various dimensions of nature, the study will examine specifically CN as a moderator.

Mindfulness as a Moderator

Because attention is considered a resource which can be depleted and restored, and mindfulness is an attribute of attention, mindfulness, like nature, can also moderate the relationship between stressors and PWB. In the stress process, appraisal, particularly positive appraisal, plays an essential role because it is related to positive outcomes such as well-being. Therefore, extant studies (Garland, Gaylord, & Park, 2009; Garland, Gaylord, & Fredrickson, 2011) have proposed that mindfulness is a resource that can help facilitate positive appraisal during the coping process. In addition, mindfulness-based practices help improve attention and lower cortisol levels, which is associated with stress (Tang et al., 2007; Danucalov et al., 2013)

as well as improve other cognitive functions such as memory (Mrazek et al., 2013; Hölzel et al., 2013). Mindfulness has been effective in reducing stress associated with cancer (Carlson et al., 2001). Evidence-based research has demonstrated that mindfulness is effective across different populations such as veterans with posttraumatic stress disorder (PTSD) (King et al., 2016), and various age groups such as young adults (Song & Lindquist, 2015), children (Mendelson et al., 2010; White, 2012), and adolescents (Barnes, Treiber, & Davis, 2001; Barnes, Bauza, & Treiber, 2003). Furthermore, prolonged mindfulness practice such as daily practice or through an 8-week intervention, contributes to an increased ability to self-regulate automatic or habitual responses to stressful events. However, recently, Lim and Qu (2017) reported that a single-session of mindfulness is also effective at enhancing attentional control.

Stress Reduction Theory

When coping resources are depleted, certain environments provide opportunities or can facilitate and/or inhibit the restoration of resources such as attention. Moreover, different environments have different characteristics, and these characteristics can be positive, negative, or neutral. Stress Reduction Theory (SRT) posits that some environments negatively affect well-being and others have restorative qualities (Ulrich et al., 1991). For instance, Ulrich (1984) sampled hospital patients recovering after surgery. The researcher examined patients' affective responses to certain aesthetics and the restorative influences of specific environments on well-being, which was demonstrated through the patient's recovery time. Ulrich (1984) theorized that being exposed to certain environments can affect one's emotional state, which in turn, might influence their recovery rates. Therefore, the researcher examined whether being assigned to a hospital room after surgery with either a window with viewing trees or a brick wall would

influence the patient's recovery rate. Recovery rate was calculated from the days hospitalized starting from the day of surgery to the day of discharge. Ulrich (1984) reported that patients who were assigned to a room with a window with views of trees had shorter hospitalization days and took less medication during their stay than compared to those with a window with a view of a brick wall.

People describe natural environments as peaceful or tranquil (Kalvaitis & Monhardt, 2012; Finley et al., 2015; Windhorst & Williams, 2015) and natural environments tend to be moderately stimulating, for example with soft sounds of birds or water, which are gently absorbing. Peaceful environments are conducive to reflection, which requires cognitive resources. In contrast, an urban environment presents a high level of stimulation that makes demands upon attention. For example, attending to the movement of people or cars in order to plan one's path requires attention that is then not available for in-depth reflection. As demonstrated in Berman et al. (2012), we see the restorative effects natural environments have on attention and memory for healthy individuals as well as increased positive affect for those with psychological symptoms (Berman et al., 2010).

Preferences for natural environments over built ones support the biophilia hypothesis. Research has examined environmental preferences among adults experiencing stressors. Stigsdotter and Grahn (2011) explored the dimensions of outdoor environments in relation to increased physical activity and psychological restoration of Swedish adults. Results indicated distress was greater for young mothers who had less access to green environments and showed greater preference for more green environments. Participants with higher stress levels reported a higher preference for more restful activities such as resting in a green setting, experiencing fresh

air, observing plants, and "actively searching for peace" (p. 300). Results from Stigsdotter and Grahn (2011) demonstrate the positive buffering effects nature has against stressors because this study provided support for SRT: participants surrounded by green spaces reported lower levels of distress than participants with less access to green environments. The green environment may function as a coping resource as it facilitates decreased distress. As a result, the natural environment contributed to greater well-being as well as an environment that participants believe would afford them the opportunities for restoration.

Having adequate resources is crucial to effectively cope with stressors (Lazarus & Folkman, 1984). Hence, resource inadequacy such as lack of directed attention may lead to poorer coping strategies and outcomes. Evidence has documented that more greenery is related to greater restoration of attention as well as stress reduction. Additionally, research has demonstrated that natural elements such as plants are effective in reducing distress, particularly in hospital environments, because of the attractiveness of natural elements. For example, Dijkstra, Pieterse, and Pruyn (2008) conducted a between-groups experimental study by exposing participants (undergraduates) to either a picture of a hospital room with indoor plants or an urban painting. Participants' levels of perceived distress were measured as well as their rating of the attractiveness of the hospital room. Results indicated that the indoor plant group had lower levels of distress than the urban painting condition. The mediation analysis revealed that participants in the indoor plant condition reported feeling less distress, which was related to reporting higher levels of attractiveness of the hospital in the plant condition. This study documented the positive effects of nature or natural elements in reducing distress in an environment, such as a hospital, that is commonly considered to be stressful.

Conceptual Framework for this Study

Having a better understanding of the roles that CN, mindfulness, and stressors play in the association between exposure to nature and PWB will benefit society because our results can be relevant to how programs, policies, and environments are designed and structured to improve PWB. Based on the studies documenting positive effects of CN and mindfulness on PWB, it is reasonable to hypothesize that both CN and mindfulness could potentially function as resources to help people cope with stressors. For this study, I am proposing a conceptual framework that integrates biophilia, ART, and SRT into a single model (see Fig. 1 below). The beginning of the model starts out with exposure to nature, which is informed by the biophilia hypothesis and evidence that exposure to nature is associated with improved PWB (e.g., Taylor & Kuo, 2009). Next, this model explains how associations between exposure to nature and PWB are grounded in three major theoretical frameworks of ART, biophilia and CN, and SRT. Then, the proposed model links those three theories to the construct of mindfulness. The outcome of the model is PWB, because the overarching goal for examining these processes is to understand how this knowledge can be applied to enhance PWB.

Linking Exposure to Nature, Attention, Connection to Nature, and Stress Reduction to Psychological Well-being

Nature exposure affords opportunities for restoration and rejuvenation, which improves PWB. Three potential mediating pathways from nature exposure to PWB are proposed. One pathway is cognitive restoration, specifically attention, and is informed by ART and research indicating that attention is more likely to be restored in natural environments than in built environments (e.g., Berman et al., 2012; Berman, Jonides, & Kaplan, 2008). Thus, the model

proposes that attention will be positively associated with mindfulness.

Connection to nature is the second proposed pathway to PWB, and is informed by the biophilia hypothesis and by evidence that CN is associated with well-being (e.g., Nisbet, et al., 2011; McCurdy et al., 2010; Finley et al., 2015). The third proposed pathway is informed by SRT, specifically involving reduction of distress in the context of natural environments (e.g., Dijkstra, et al., 2008). It is important to include ART, CN, and SRT in the model because all these constructs have been associated with PWB.

The model posits that CN, attention, and reduced distress are all positively associated with mindfulness. The current study will test direct effects of CN and reduced distress on PWB, as well as indirect effects mediated by mindfulness. I expect CN to be positively associated with mindfulness because research has provided evidence that both CN and mindfulness are positively associated with attentional capacity, which can enhance well-being by facilitating cognitive restoration and associated processes such as reflection. I also expect reduction of distress to be associated with mindfulness because extant literature documented the efficacy of mindfulness-based practices such as meditation in reducing levels of distress among diverse populations, both clinically diagnosed and non-clinical participants.

METHODS

Design

This correlational study is designed to better understand how mindfulness, connection to nature (CN), and stress function independently as well as jointly to promote overall psychological well-being (PWB). With an array of empirical studies documenting the significant role of CN and mindfulness with PWB, especially through decreased distress, it is important to generate new understanding of how CN and mindfulness influences people's vulnerability or resilience to stressors.

Sample

This study used a convenience sample of majority undergraduate students (*N*=276; *n*=239 females; *n*=37 males), with *n*=3 graduate students from a Midwestern university. Students were recruited through class presentations during Fall 2016 semester. The majority (83.3%) of the participants identified as Caucasian, 7.6% Other, 5.4% Asian, 3.3% Black or African American, and 0.4% American Indian or Alaska Native. A majority of the students were between the ages of 18 to 24 years(*n*=252), had never been married (*n*=256), and were either seniors (*n*=86) or juniors (*n*=81) at the university (see Table 1).

Procedures

Recruitment of college students took place in classes from departments such as psychology and social science because classes from these departments were most accessible. Five professors and two graduate student instructors who were teaching undergraduate courses during Fall 2016 were contacted through email about the current study. All professors and instructors who were contacted agreed to allow their students to participate in the research

survey, which took about 20-25 minutes to complete. In exchange for the students' participation, the professors all agreed to give their students extra credit for their class. After the professors/instructors gave the researcher permission to recruit participants from their class, the following steps occurred: (1) the researcher emailed the professor the recruitment script to share with the students, which included information about the current study and the Qualtrics links to both the study and an alternative assignment option; and (2) the researcher came to class either during the beginning or towards the end of class time to tell potential participants about the study. The recruitment script can be found in Appendix B.

Following the Institutional Review Board (IRB) at the University of Nebraska-Lincoln protocol, to avoid coercion or because participants were not 19 years of age, the researcher provided students with an alternative assignment to gain extra credit for the class without having to participate in the current study. Data from the alternative assignment were not included in this study. Participants who chose to complete the survey for the current study filled out the consent form online by typing their full name before completing any questions from the survey. Students were only allowed to complete either the research survey or alternative assignment to earn extra credit once. During the physical recruitment, students were informed that if both options were completed that only points for one option would be given. Links to the survey and alternative assignment were opened from October to finals weeks in December. However, certain professors had a specific window or deadline of when they allowed their students to complete the survey for extra credit (e.g., two weeks from announcement or by the Friday of finals week). The deadlines were explicitly communicated to the researcher. Therefore, any students who had completed neither of the extra credit options by the deadline for their class deadline were not awarded the

additional points. To document the extra credit, at the end of each deadline the researcher emailed each professor a full list of students' names who had participated in the study. Students' names were securely stored on the UNL Box system and only the researcher had accessed to the dataset. Additionally, to ensure the students' confidentiality, during the data cleaning process, the researchers deleted the participants' identifiable personal information from the larger dataset before any analyses were conducted.

Measures

Demographic information. To gather demographics information, participants completed a questionnaire with questions regarding their age, gender, ethnicity, year in college, and marital status.

Connection to nature. To measure participants' levels of connectedness to nature, the Connection to Nature-Single Item (CN-SI; Cervinka, Röderer, & Hefler, 2012) and the Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004) were administered. Both the CNS and Connectedness to Nature Scale (CNS; Mayer & Frantz, 2004) were included because if the results revealed that both measures were highly correlated then it may reasonable to use the CN-SI alone in future studies. CN-SI is a single-item measure that asks participants to rate the following statement, "My connectedness to nature is…" on a 10-point Likert scale ranging from 1= "*Very Low*" to 10= "*Very High*" with higher scores indicated greater connection with nature. The CNS is a 14-item questionnaire that is rated on a 5-point Likert scale with 1= "Strongly Disagree" to 5= "Strongly Agree." CNS was designed to measure "individual's affective, experiential connection to nature" (Mayer & Frantz, 2004, p. 504). Sample items from the CNS include, "I often feel a sense of oneness with the natural world around me," "I recognize and

appreciate the intelligence of other living organisms," "When I think of my life, I imagine myself to be part of a larger cyclical process of living" and "I have a deep understanding of how my actions affect the natural world." The mean was used for this measure. For this study, to measure CN, a variable called Connection to Nature (CTN) was created by combining items from the CNS and CN-SI together. CN-SI was given equal weight as all the original items on the CNS measure. CTN had a Cronbach's alpha coefficient of 0.87.

Time in nature. Because CN is a psychological construct that is an extension of the biophilia hypothesis, it was important to investigate the average amount of time the participants were exposed to the natural world or elements of nature such as blue (e.g., aquatic spaces such as water fountains) or green areas (e.g., grass or trees). Frequent exposure to green or blue spaces may facilitate the connection with nature. Therefore, we asked participants to respond to the following open-ended question, "*On average, how many minutes per day do you spend outdoors in an area that has natural elements such as grass, trees, and water?*" This variable was called CN-Time.

Mindfulness. Because both attention and awareness are key components of mindfulness, two mindfulness measures were used for this study. Items from the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) focus more on 'attention' while items from the Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) center more around 'awareness' and 'acceptance' The MAAS consists of 15 items with questions aiming to assess individuals' levels of mindful attention. Sample questions from the MAAS include, "I pay attention to sensations, such as the wind in my hair or sun on my face" or "I find it difficult to stay focused on what's happening in the present." All questions are rated on

a 6-point Likert-type scale ranging from 1= "*Almost Never*" to 6= "*Almost Always.*" Higher scores on the MAAS indicate greater levels of mindful attention. For this study, the MAAS had acceptable internal consistency (Cronbach's alpha coefficient = 0.71). The mean was used for the MAAS.

The PHLMS is a 20-item instrument used to assess the components of awareness and acceptance that is present-center focused. The PHLMS has two 10-item subscales (1) Awareness and (2) Acceptance. The PHLMS can to be administered to both clinical and non-clinical populations. Questions are rated on a 5-point Likert-type scale, ranging from 1= "*Never*" to 5= "*Often.*" Sample items from the PHLMS include, "I am aware of what thoughts are passing through my mind," "When I walk outside, I am aware of smells or how the air feels against my face," and "I am aware of thoughts I'm having when my mood changes." A mean score is computed for each of the subscales with higher scores indicating higher levels of mindfulness awareness and acceptance. For this study, the overall and subscale reliability was good (total score $\alpha = 0.79$; Mindful Awareness $\alpha = 0.84$; Mindful Acceptance $\alpha = 0.78$).

Distress. Two measures of distress were used for this study because it is important to understand the types of stressors participants experience as well as their perception of their distress. The Life Events List (LEL; Cohen, Tyrrell, & Smith, 1991) is a 24-item questionnaire designed to assess the types of stressors experienced by the participants over the past 12 months as well as the degree of distress experienced with each life event. Most of the items are dichotomous questions that require a "yes" or "no" response such as "Did you get married during the last 12 months?" or "Did someone you were close to die during the last 12 months?" If participants responded 'yes' to any of the questions, then they were asked to report their feelings

regarding the life event. Ratings of the events are scored into positive and negative categories with 1= "*Very Good,*" to 6= "*Very Bad*" as a Negative Event (Cohen, Tyrrell, & Smith, 1991). The LEL has an internal consistency (Cronbach's alpha coefficient) of 0.74 (Cohen, Tyrrell, & Smith, 1991). Unfortunately, the frequencies on the Life Events List was so low that it was impossible to compute composite variables called 'negative events' and 'positive events.' Therefore, data from this measure were excluded from the statistical analysis.

The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) was used to assess participants' levels of distress. The PSS is a 10-item measure to evaluate participants' perceptions of stressful events in their lives over the past month. The PSS is a commonly used psychological measure for assessing perceptions of stress by examining the degree in which situations are appraised as stressful (Cohen, Kamarck, & Mermelstein, 1983). All questions ask participants to rate their thoughts and feelings about a particular negative event that happened during the past month on a 5-point scale ranging from 0= "*Never*" to 4= "*Very Often*." A sample questions from the PSS is, "*In the last month, how often have you been upset because of something that happened unexpectedly?"*. For this study, the PSS had good internal consistency (Cronbach's alpha coefficient = 0.87). A mean was computed for the PSS.

Psychological well-being (PWB). This study included three measures of well-being: life satisfaction, negative affect, and positive affect. The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985), a five-item questionnaire, is rated on a 7-point scale which ranges from 1= "*Strongly Disagree*" to 7= "*Strongly Agree*." Higher scores indicate greater levels of life satisfaction. Example questions include "I am satisfied with my life," and "In most

ways my life is close to my ideal." The mean score was used for this measure. For this study, the SWLS had good internal consistency (Cronbach's $\alpha = 0.90$).

The Hospital Anxiety and Depression Scale (HADS; Bjelland, Dahl, Haug, & Neckelmann, 2002) is a 14-item measure with two subscales (anxiety and depression) to assess participants' anxiety and depression levels over the past week. Sample questions from the HADS for anxiety and depression include, "I feel tense or 'wound up'" and "I still enjoy the things I used to enjoy." The questions were rated on a scale from 0 through 3 with labels differentiating across each question. For example, some questions offer responses that include: "*Most of the Time*" to "*Not at all"* or *"Very definitely and quite badly"* to *"Not at all."* Scores of seven or less indicate "normal" levels for depression and anxiety, 8 through 10 points indicate "borderline abnormal," and 11 through 21 points indicate "abnormal." For this study, the total HADS measure had good reliability (Cronbach's alpha coefficient = 0.82) and subscale reliability was acceptable (Cronbach's alpha for anxiety = 0.78 and depression = 0.67). Item 6 ("I feel cheerful) from the depression subscale was accidentally left out of the survey. The total mean score was used for this measure.

The Positive States of Mind scale (PSOMS; Horowitz, Adler, & Kegeles, 1988), is a 6-item measure that was used to evaluate individuals' perceptions of their positive emotional and cognitive experiences regarding events occurring in their lives over the past week. Participants rated each statement on a 3-point scale with 0= "*Unable to Have It* to 3= "*Have It Easily.*" Sample questions from the PSOMS include, "Feeling able to attend to a task you want or need to, without many distractions from within yourself" or "Feeling of being able to stay at work until a task is finished, do something new to solve problems, or express yourself creatively." The

mean score was used for this measure. For this study, the PSOM has an internal consistency (Cronbach's α) of 0.81. Descriptive statistics for all measures are presented in Table 2.

RESULTS

Data Analysis

Preliminary analyses were conducted to examine means, standard deviations, and Cronbach's alpha coefficients for all variables. Pearson correlations were computed to test the hypotheses that there would be positive associations between CN and mindfulness with positive indicators of PWB and inverse associations with negative indicators of PWB and stress. Pearson correlations also tested the hypothesis that there would be a negative association between stressors and positive indices of PWB but a positive association between stressors and negative indicators of PWB. The second aim of this study was to determine whether mindfulness mediates the association between CN and PWB and stress. Therefore, following Baron and Kenny's (1986) statistical procedure for testing mediation, I computed a multiple regression analysis with CN as the exogenous variable, mindfulness as the meditator, and PWB and distress as the outcome variables. The third aim of this research was to determine whether mindfulness moderates the association between stress and PWB and whether CN moderates the association between distress and PWB. Interaction terms were constructed to test for moderation. The first moderation analysis had distress as a causal variable, mindfulness as the moderator, and PWB as the outcome variable. The second moderation test had CN as the moderator with distress as an independent variable and well-being as an outcome variable.

Preliminary Analyses

Bivariate correlations (Pearson's Correlation) for the variables connection to nature,

mindfulness, stress, and psychological well-being (PWB) are presented in Table 3. Contrary to hypotheses, connection to nature (CTN) and CN-Time were not significantly correlated with Positive States of Mind (PSOMS), Satisfaction with life (SWLS), or anxiety. CN-Time was not correlated with PSS, but there was a significant negative correlation between CTN and Perceived Distress (PSS) (r= -.15, p <.05). Moreover, the correlation between CTN and depression was marginally significant (r= -.12, with a p=. 052). The first hypothesis was partially supported and results are presented in Table 3 (see Table 5 for a full summary of hypotheses and level of support).

As hypothesized, there was a significant positive correlation between PSOMS and mindful attention (r=.46, p <.01), PSOMS and mindful awareness (r=.22, p <.01), and PSOMS and mindful acceptance (r=.34, p <.01). That is, as positive states of mind increased, so did mindfulness. There were significant inverse associations between depression and mindful attention (r= -.37, p <.01), mindful awareness (r= - .23, p <.01), and mindful acceptance (r= -.31, p <.01), which means that as mindfulness increased, depression decreased. PSS was inversely associated with mindful attention (r= -.54, p <.01), mindful awareness (r= - .18, p <.01), and mindful acceptance (r= -.50, p <.01). This suggests that when perceived stress increased, there was a decrease in the overall construct of mindfulness as well as decreases in mindful awareness and mindful acceptance. There were also positively significant associations between life satisfaction and all mindfulness measures, indicating that as mindfulness increased, life satisfaction increased, or vice versa. Anxiety was significantly and negatively correlated with two mindfulness measures: the mindful attention (r= -.5, p <.01) and mindful acceptance (r= -.46, p <.01), but not mindful awareness (r= -.08, ns). That is, as anxiety decreased, mindfulness

increased. The second hypothesis was partially supported. Results are presented in Table 3.

As hypothesized, bivariate correlations indicated that PSS was negatively associated with PSOMS (r= -.58, p<.01) and SWLS (r= -.59, p <.01) which means that as stressors increased, positive states of mind and life satisfaction decreased. Results also indicated that PSS was significantly and positively associated with anxiety (r= .70, p<.01) and depression (r= .53, p <.01), that is, as stressors increased so did depression and anxiety. The third hypothesis was fully supported and results are presented in Table 3.

Independent sample t-tests were conducted to test for mean differences in all independent variables as a function of gender (see Table 4). Results indicated there were no mean differences in CTN, CN-Time, anxiety, MAAS, mindful awareness, mindful acceptance, anxiety, or PSS scores for males and females. However, t-tests indicated that females' scores on PSOMS (M=2.18, SD=.53) were significantly higher than males (M=1.98, SD=.62, t (272) = -2.05, p=.041, d=-.36) and life satisfaction was significantly higher for females (M=4.88, SD=1.26 for females and M=4.31, SD=1.37 for males, t (272) =-2.58, p = .011, d= -.46). Males' depression scores (M=.82, SD= .46) were significantly higher than females' (M=.65, SD=.47, t (272) = 2.07, p= .039, d= .37).

Mediation Analyses

The second aim of this study was to determine whether mindfulness mediates the association between CTN and PWB and stress. To test the fourth hypothesis that mindfulness mediates the association between CTN and well-being (depression) and stress (PSS), two mediation analyses using multiple regression analyses were performed (Baron & Kenny, 1986). Although the correlation between CTN and depression was r=-.12 with a p-value of .052, which

indicates a marginally significant association, a mediation analysis was conducted because this is a theory-driven study that postulated that mindfulness would mediate the association between CTN and PWB. The second mediation analyses were performed to test the association between CTN and distress with mindfulness as a mediator. For each mediation analysis, the first set of regression analyses tested the association between CTN and the outcome variable (PWB and distress), and the second set of analyses tested the association between CTN and the mediator (mindfulness). The last set of analyses tested the association between CTN and the mediator while controlling for PWB and distress.

The first mediation analyses were performed with CTN (independent variable) with depression and PSS (dependent variables) because the correlations were significant. When depression was the outcome variable in the mediation analyses, only the mindfulness variable of mindful awareness was used as a mediator because it was the only mindfulness variable significantly correlated with the independent variable CTN, which fulfilled the second requirement of Baron and Kenny's (1986) mediation protocol. However, when PSS was the outcome variable in the mediation analyses, both mindful attention and mindful awareness were individually used as mediators in the analyses because both were significantly correlated with CTN.

Depression. The first set of regression analyses tested the association between CTN and depression. Results indicated that CTN significantly predicted depression (β= -.12, p=.052), indicating that participants with lower levels of depression were more likely to have higher CN. The second set of regression analyses tested the association between CTN and mindful awareness. The results from the second regression analysis yielded a significant association (β=

.44, p <.001) between CTN and mindful awareness. Another regression was performed to test whether the association between CTN (independent variable) and depression (dependent variable) was mediated by mindful awareness. In this last regression analysis, CTN and mindful awareness were independently added as a second predictor, while controlling for the criterion, depression.

Results from the first mediation analysis revealed that mindful awareness fully mediated the association between CTN and depression (β= -.02, p=.81) because the CTN-depression association was reduced to nonsignificance while mindful awareness retained its significance (β= -.23, p<.001). Using a Sobel test, which tests the how much of the CTN effect is carried by the mediator to the dependent variable (depression), results supported the mediating effects of mindful awareness on the association between CTN and depression (Z= -3.41, p =.001). Results are illustrated in Fig. 2. The fourth hypothesis was partially supported.

Distress. The first set of regression analyses tested the association between CTN and PSS. Results from the hierarchical regression analysis indicated that CN significantly predicted PSS (β= -.15, p=.01), indicating that participants with lower levels of PSS were more likely to have higher CN. The second set of regression analyses tested the association between CTN and mindfulness. Results of the two regression analyses yielded a significant association between CTN and mindful awareness (β= .44, p <.001) and CTN and MAAS (β= .25, p <.001). Two additional multiple regression analyses were performed to test whether the association between CTN (independent variable) and PSS (dependent variable) was mediated by mindful awareness and MAAS. In the two final regression analyses, CTN and two of the mindfulness variables (mindful awareness and MAAS) were independently added as predictors, while controlling for

the criterion, depression.

When mindful awareness was the mediator, results indicated that the association between CTN and PSS was reduced to nonsignificance, fitting the conditions for full mediation (β= -.09, p=.19), whereas mindful awareness retained its significance (β= -.14, p=.03), which indicates full mediation. Using a Sobel test, results supported the mediating effects of mindful awareness on the association between CTN and PSS (Z= -2.12, p =.03). Results are illustrated in Fig. 3. When mindful attention was the mediator, results indicated that mindful attention fully mediated the association between CTN and PSS (β= -.02, p=.74), whereas mindful attention retained its significance (β= -.54, p<.001), which revealed full mediation. Results from the Sobel test provided support for the mediating effects of MAAS on the CTN-PSS association (Z= -3.96, p <.001) (see Fig. 4). The fourth hypothesis was partially supported.

Moderation Analyses

Hierarchical multiple regression was used to determine whether mindfulness moderated the association between distress and PWB and whether CN moderated the association between distress and PWB. The fifth and sixth hypotheses were that CN and mindfulness would moderate the association between distress and well-being. Multiple regression analyses were conducted to test the interaction of PSS and CN, (PSS x CTN and PSS x CN-Time), mindfulness (mindful attention, mindful awareness, and mindful acceptance), and PSS x mindfulness in predicting PWB as anxiety, depression, PSOMS, and SWLS as dependent variables. Because gender was significantly correlated with depression, PSOMS, and SWLS, gender was controlled in all the analyses. Results are reported in Table 5.

Anxiety. In Model 1, independent variables (CTN, CN-Time, PSS, MAAS, mindful

awareness, and mindful acceptance) accounted for 53% of the variance in anxiety, F (7, 266) = 42.88, p <.001, R^2= .53. In Model 2, the CN and mindfulness interaction terms explained 1% of additional variance, F (5, 261) = 25.56, p <.001, R^2= .54. However, none of the interaction terms significantly predicted anxiety. Results are reported in Table 5.

Depression. In Model 1, independent variables accounted for 33% of the variance in depression, F (7, 266) = 18.81, p <.001, R^2= .33. In the Model 2, the CN and mindfulness interaction terms explained an additional 4% of variance, F (5, 261) = 12.78, p<.001, R^2= .37. None of the CN interaction terms significantly predicted depression. Therefore, the fifth hypothesis was not supported as results did not indicate CN moderating the association between distress and depression

However, mindfulness was found to moderate the association between distress and depression. Specifically, the interaction between PSS and mindful acceptance significantly predicted depression (β= -.15, t=-2.30, p <.05). To understand the nature of the interaction term, the association between PSS and depression at three levels of mindful acceptance was plotted: high (+1 SD), average (mean), and low (-1 SD) (Aiken & West, 1991). This interaction is illustrated in Fig. 5. Simple slopes analyses showed that the slope for PSS on depression when mindful acceptance was high (t=4.73, p <.001), average (t=8.72, p <.001), and low (t=8.34, p <.001) was significantly different from zero. Moreover, the low mindful acceptance slope was significantly different from the high mindful acceptance slope, t=2.83, p <.05. However, low acceptance slope was not significantly different from the average mindful acceptance slope (t=1.54, p=.13). In addition, the slope for average mindful acceptance was not significantly different from high mindful acceptance (t=1.53, p=.13). The sixth hypothesis was partially

supported.

PSOMS. In Model 1, the independent variables accounted for 41% of the variance in PSOMS, F (7, 266) = 25.97, p <.001, R^2= .41. In Model 2, the CN and mindfulness interaction terms explained 2% of additional variance, F (5, 261) = 15.93, p <.001, R^2= .43 but results did not indicate CN and mindfulness moderating the association between distress and PSOMS. See Table 5.

Life satisfaction. In Model 1, independent variables accounted for 40% of the variance in life satisfaction, F (7, 266) = 25.60, p= <.001, R^2= .40. In Model 2, the CN and mindfulness interaction terms explained an additional 2% of variance, F (5, 261) = 16.00, p= <.001, R^2= .42. Results did not provide support for the fifth hypothesis because none of the CN interaction terms significantly predicted life satisfaction.

In spite of that, in Model 2, results provided support of mindfulness buffering the effects of distress on life satisfaction because the interaction between PSS and mindful acceptance was significantly related to life satisfaction (β= .13, t=-2.30, p <.05). To understand the nature of the interaction term, the association between PSS and depression at three levels of mindful acceptance was plotted. This interaction is illustrated in Fig. 6. Simple slopes analyses showed that slope for PSS on life satisfaction when mindful acceptance was high (t=-6.55, p <.001), average (t=-10.83, p <.001), and low (t=-6.55, p <.001) was significantly different from zero. The low mindful acceptance slope was significantly different from the high mindful acceptance slope, t=11.85, p <.001. The slope for average mindful acceptance was significantly different from high mindful acceptance (t=11.97, p<001). However, low acceptance slope was not significantly different from the average mindful acceptance slope (t=1.50, p=.13), partially

supporting the sixth hypothesis.

DISCUSSION

The purpose of this study was to examine how CN and mindfulness are related to distress and PWB. More specifically, this study investigated: (1) the associations between CN and PWB and distress, (2) the relations between mindfulness and PWB and distress, (3) the potential mediating role of mindfulness in the association between CN and PWB and distress, and (4) the potential moderating roles of mindfulness and CN in predicting distress and PWB. Consistent with past studies (Richardson & Sheffield, 2015), results from the current study found that CN was significantly and positively associated with mindfulness on the MAAS measure and mindful awareness subscale of the PHLMS. However, CN was not significantly associated with mindful acceptance, which differs from results reported by Howell et al. (2011). As predicted, CN was negatively associated with distress while there was only a marginally significant association between CN and depression in the expected direction. However, CN did not significantly predict PWB on measures of life satisfaction, positive states of mind, or anxiety. Therefore, bivariate correlations provided partial support for Hypothesis 1, in that CN would be significantly correlated with PWB and stress. These results are somewhat inconsistent with previous research, as extant studies found CN to be significantly correlated with PWB (Howell et al., 2011; Loureiro and Veloso, 2014), however these studies measured similar constructs but used different scales. It is possible that the results from this study differed because some previous studies included a single measure to assess overall PWB instead of specific components of PWB such depression or anxiety as it was measured in this study. Others have measured positive and negative affect as components of PWB (Wolsko & Lindberg, 2013), which were not assessed in

the current study. Positive and negative affect are quantitatively and qualitatively different from anxiety and depression, which measure clinically significant levels of negative affect. It is important to consider differences between these measures of PWB. Therefore, future studies should consider these differences when choosing measures of PWB. Moreover, this study used the same life satisfaction measure on a similar sample with undergraduate students as Zhang et al. (2014), so it is surprising I did not find that CN was a significant a predictor of life satisfaction as Zhang et al. (2014) had reported. However, Cervinka et al, (2011) used the same life satisfaction scale as both this study and Zhang et al. (2014) but sampled international participants and did not find an association between CN and life satisfaction.

Although there was a significant positive association between time in nature (CN-Time) and CN, the amount of time spent in the natural world was not associated with other outcome variables. One hypothesis is that people with higher CN may have a greater preference for natural environments such as woodlands compared to small city parks. Moreover, because the sample are mostly students, their current geographic location may make it challenging for them to have access to deep nature experiences where they can fully immerse themselves into the natural world.

Correlational analyses provided partial support for the hypothesis that mindfulness would be associated with distress and PWB. Consistent with past studies, all measures of mindfulness were significantly correlated with positive states of mind, depression, life satisfaction, and distress. However, mindful awareness was not significantly associated with anxiety in this study, while others have reported an inverse association between anxiety and mindfulness (Bränström et al., 2010). It is possible that studies such as Bränström et al., (2010)

found that mindful awareness was associated with significantly reduced anxiety because researchers had implemented an 8-week mindfulness intervention which helped cultivate mindfulness within the participants. Moreover, Bränström, Duncan, and Moskowitz (2011) also reported a significant association between mindful awareness and anxiety. However, both Bränström et al. (2010) and Bränström et al. (2012) used the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) while the MAAS and the PHLMS were used in the current study. More specifically, the FFMQ includes five dimensions that are common in mindfulness research which include: (1) Observing; (2) Describing; (3) Acting with awareness; (4) Non-judging of inner experience; and (5) Non-reactivity to inner experience. The items assessing mindful awareness on the FFMQ have participants rate statements that are generally true about their overall character or own behaviors such as "*When I do things, my mind wanders off and I'm easily distracted"* or "*I am easily distracted*." For this study, the measure that was used to assess mindful awareness over the past week included statements that reflected the participants' own behaviors as well as their mindful awareness of others, such as, "*When talking with other people, I am aware of their facial and body expression*" or "*When talking with other people, I am aware of the emotions I am experiencing*." The differences in items across these measures may explain the inconsistencies in results of the current study compared to previous research.

Consistent with hypotheses and previous research, results from this study showed that distress was negatively associated with CN (Loureiro & Veloso, 2014), mindfulness (e.g., Bao, Xue, & Kong, 2015; Cordon, Brown, & Gibson, 2009), life satisfaction, and positive states of mind (Jain et al., 2007) but positively associated with depression and anxiety (Ando et al., 2009).

Mindfulness as a Mediator

This study also examined the potential mediating effects of mindfulness on associations between CN and multiple indicators of PWB, as well as the potential mediating role of mindfulness on the association between CN and distress. With respect to the association between CN and PWB, results from mediation analysis revealed that across all mindfulness measures (mindful attention, mindful awareness, and mindful acceptance), mindful awareness was the only variable associated with depression, and the association was marginal. However, because the hypothesized model was theory-driven, a mediation analysis was conducted to test mediating effects of mindful awareness on the association between CN and depression. Results indicated that mindful awareness fully mediated the association between CN and depression. In the context of previous empirical studies, to date, no studies have examined the association between CN and PWB with mindfulness as a mediator. However, there is one study that examined spirituality as a mediator of the association between CN and eudaimonic well-being (Trigwell et al., 2014) and PWB (Kamitsis & Francis, 2013). In regards to the conceptual model of this study (Fig.1), it appears that CN helps facilitate mindfulness, specifically mindful awareness, as being in natural environments afforded people opportunities to be reflective and attuned with their surroundings. Natural environments can offer opportunities to restore attention, which is an attribute of mindfulness. As a result, those high in CN tended to be high in mindfulness, which decreased negative indices of PWB such as depression.

Statistical analyses to test mindfulness as a mediator of the association between CN and distress yielded results that provided partial support for the Hypothesis 4. Mindful attention and mindful awareness both fully mediated the association between CN and distress. The findings of

this study suggest that mindfulness may be one mechanism through which CN is linked to reduced distress as proposed in the conceptual model of this study. More specifically, as participants' CN increased, results suggest their ability to be more mindfully aware and attentive also increased. Moreover, a significant body of research indicates that increased mindfulness is associated with lower distress (e.g., Carmody & Baer, 2008), which in turn, can increase well-being.

CN and Mindfulness as Moderators

This study also examined connection to nature and mindfulness as moderators of the association between distress and PWB. However, results revealed that neither measure of connection to nature significantly moderated this association. In spite of that, to the best of my knowledge, no existing empirical studies have examined the association between distress and PWB with CN as a moderator. Engagement with nature's beauty has been linked to CN (Zhang et al., 2014), as those with higher CN may have a greater preference of nature and therefore be more engaged with the natural environment. Moreover, those who are more engaged with nature may also have a greater aesthetic appreciation for the natural world. As such, both engagement and appreciation for nature are key processes through which people can relate with the natural environment. One study examined the moderating effects of engagement with nature on the association between CN and PWB (self-esteem and life satisfaction) and reported that engagement with nature was associated with higher CN, self-esteem, and life satisfaction. Findings from Zhang et al. (2014) suggest that those who are more emotionally attuned to the beauty of the natural world may have greater benefits from their connection to nature, and using other measures of CN such as engagement with nature's beauty, can be useful in future research.

For example, there are different dimensions of CN, in addition to engagement with nature's beauty, such as environmental aesthetics (e.g., Gobster, Nassauer, Daniel & Fry, 2007; Ulrich, 1979), which can be another way in which CN be operationalized and measured.

Results from the moderation analyses varied for the association between distress and PWB, that is, not all associations were significantly moderated by mindfulness. For example, neither measure of mindfulness significantly moderated the association between distress and positive states of mind or anxiety. However, consistent with previous studies, we found that mindfulness significantly moderated the association between distress and PWB (e.g., Bränström et al., 2013), specifically, depression and life satisfaction. In contrast to our findings, Bränström et al. (2013) specifically found the facet of mindful awareness moderated the association between perceived stress and depression, while our study found mindful acceptance moderated the same association. Differences in results of the current study and results of Bränström et al. (2013) may be at least partially explained by the different mindfulness measures used in each study. For example, Bränström and colleagues (2013) used the FFMQ while the current study used the PHLMS. In spite of these inconsistencies, a more important note is that these results suggest that different dimensions of mindfulness might buffer against the negative effects of distress by functioning as a moderator of the association between distress and PWB. The results from the current study provided partial support for Hypothesis 6.

Implications

Results from the current study have several significant implications. First, with respect to the human-nature relationship, findings provide further evidence that connections with the natural world enhance multiple dimensions of well-being, including life satisfaction, positive

states of mind, depression, anxiety, and distress. Moreover, mindfulness was a significant predictor of life satisfaction and positive states of mind, and inversely predicted depression and anxiety. Therefore, programs designed to enhance human health and well-being may benefit from integrating more natural elements such as water fountains or plants and mindfulness practices, especially when mindfulness demonstrated to buffer some effects on distress. In addition, business buildings such as hospitals can have landscapers add more greenery into their designs, as the natural elements have shown to increase the recovery process for patients (Ulrich, 1979; 1984).

Second, results from the mediation analyses suggest that connection to nature may be another pathway to facilitate and cultivate mindfulness. This information is important because although meditation is a common practice to foster mindfulness, people may find the practice challenging as it requires resources such as time which has been reported as a barrier to practice (e.g., Day, Thorn & Rubin, 2014; Keyworth et al., 2014). There are two additional reasons why meditation may not be ideal for everyone. First, although mindfulness into interventions to promote well-being are predominantly secular, because of mindfulness' Buddhist-based origin, non-Buddhists participants may find it religiously challenging to practice meditation. Second, meditation can be challenging because it requires a person to sit still and quietly with their own thoughts and feelings, which is not a skill that is frequently practiced in everyday life. Hence, these factors contribute to the uncomfortable feeling associated with meditation practice.

During the meditation process, it is common for attention to "wander" to thoughts about everyday obligations and demands (e.g., to-do lists). Nature is an alternative form to cultivate mindfulness because natural environments elicit "fascination," an involuntary form of attention

that provokes a person's interests and curiosity (Kaplan & Kaplan, 1984). Focusing attention outward toward nature can be a more comfortable place for a person to sit with themselves. Engaging the "fascination" attentional system is restorative (Kaplan & Kaplan, 1984) because it allows the directed attention system to recover. For people who might be less comfortable with meditation, spending time in nature may help them to first focus outward on the beauty of nature, and then when they have quieted their mind it may be easier to focus inward on thoughts and feelings. Therefore, spending time in nature to can facilitate a person's CN as well as foster mindfulness, as a person directed- attention is less fatigued or used. For example, when person sits outside in a natural setting, their attention is initially focused to the external environment (e.g., trees or plants). Moreover, there is a sense of "being away" or the psychological distance physical separation from the person's daily life and everyday overstimulating environments, is restorative within itself (Kaplan & Kaplan, 1984). Natural environments can decrease arousal, promote stress recovery, and increased attention. Because attention is an attribute of mindfulness, when the person first spends time a natural environment, their attention is initially focused on their external stimulus such as the animals and greenery. However, the longer the person sits or engages with nature, their attention turns inwards to their awareness the contrasting psychological states before and after being in a natural setting. Common psychological and physical outcomes are often a feeling of calmness and mental clarity. Moreover, the natural environment can restore attentional capacity, which is an essential resource for coping with stress (Kuo, 2013; Berman et al., 2008; 2012). Attention is an essential cognitive resource for coping.

It is also imperative to note that spending time in nature can nurture connection to nature, but this association is bidirectional. That is, people with higher connection to nature are likely to

prefer spending more time in nature, which continues to maintain their connectedness to the natural world. Moreover, both exposure to nature and meditation requires resources such as time and availability, which can be barriers for practice and experience. In spite of that, both connection to nature and mindfulness can restore coping resources such as attention because each mechanism operates as a moderator and a mediator of distress.

Third, the current study found that mindfulness buffered the negative effects of perceived stress by attenuating the associations with depression and life satisfaction. These findings might apply to policymakers and program coordinators to include mindfulness-based practices or activities to promote psychological health, specifically, among populations that are exposed to numerous stressors and are at high-risk for developing psychopathology such as depression or anxiety. By doing so, it can decrease health care costs while improving mental and physical health.

Results in Relation to the Conceptual Model

Biophilia. The biophilia hypothesis provided a perspective which explains how humans are predisposed to want to affiliate with the natural world as outcomes of interacting with the natural world often included an enhanced sense of well-being. Results from the current study provided additional support for the foundational ideas for the biophilia hypothesis. Specifically, people with higher CN reported lower levels levels of distress and depression. Researchers have documented the restorative capacity of nature and findings from this study continue to support the biophilia arguments that the human-nature relationship is important for well-being. Moreover, when the interactions between humans and nature decreases, the deprivation of connection with nature can leave people more susceptible to a range of negative health outcomes

(Kuo, 2013). Therefore, the human-nature relationship is one that is worth nurturing.

ART. The Attention Restoration Theory extends from the biophilia hypothesis by offering a more in-depth explanation of the human-nature relationship. The natural world provides an environment with more soft stimuli (e.g., birds and trees). In contrast, the contemporary society or urban environments are often polluted with traffic and noises, which can overwork the cognitive systems, specifically the directed-attention system. In nature, the soft stimuli are more likely to be intriguing to a person, which in turn, activates the fascination attentional system during the human-nature encounter. The soft stimulus holds a person's fascination attention long enough for their frequently exhausted directed-attention system to be restored (Kaplan, 1995). The results from this study offer evidence-based support for ART, as CN helps facilitate mindful attention, which resulted in a decreased in depression and distress. These results are significant because if CN can cultivate mindfulness, it allows an opportunity for restoration of cognitive resources. From the ART perspective, particularly during the processes of attention recovery, the properties of a natural environment facilitate the process of contemplation or cognitive quiet and as well as "a deeper state of restoration" which can include a reflection of a person's life, actions, and goals (Roe & Aspinall, 2011, p.206). If the mind can reach a level of calmness or stillness, then a person is afforded an opportunity to interrupt the rumination process, which often includes a continuous cycle of pondering on negative thoughts and emotions. During stressful times, a quiet mind can allow a person to be more open to the process of perspective-taking and to the possibility of positive outcomes. In sum, findings provided support of CN cultivating mindful attention and mindful awareness, which in turn, increases psychological well-being are important because these results add knowledge to our

understanding of the dynamics between CN and mindfulness and also can potentially help scholars better understand the coping and appraisal process.

SRT. The Stress Reduction Theory centers more around a person's emotional and physiological responses to the aesthetics of an environment, with natural settings being an environment that is conducive to well-being (Ulrich et al., 1991). The visual aesthetic of an environment can activate psychological and physiological responses. When experiencing distress, natural elements of nature such as water or indoor plants can be visually pleasing and calming which facilitate the stress recovery process (Roe et al., 2013). In relation to the present study, people with higher CN reported lower levels of distress. This finding is significant because it can be hypothesized that people with greater CN may experience health-related outcomes such as lower distress, as CN can be a coping resource. In addition, the environment that nature offers includes aesthetics that contrast significantly from day-to-day environments. Specifically, nature offers an environment that promotes a feeling of calmness that facilitates mental clarity, which are potential key explanations of why people continue to nurture their CN, as frequent experiential interactions with nature also sustains their human-nature relationship.

Limitations and Future Directions

This study is not without limitations, which should be taken into consideration in future research studies on this topic. The first limitation is related to the sample. Demographically, the sample lacked diversity as a majority of participants identified as Caucasian, female, under the age of 24 years old, and never married. Moreover, the entire sample is from a single university, and recruited from social science courses. As a result, this population is not representative of the general population because the demographic composition lacks diversity which can influence the

results of this study. For example, because the participants are young adults, they may have greater physical health to be able to engage in more nature-based experiences such hiking or greater physically challenging outdoor recreation activities, which in turn, continues to nurture their connection with nature. In contrast, older adults or the elderly may have limited physical ability to engage with nature to the same capacity as the younger participants. Therefore, this limitation makes the results from this study less generalizable with a more diverse demographic background such as age. Future studies need to sample more diverse groups. The next limitation has to do with the gender ratio. More than 80% of the participants were females so future studies need to have a more gender proportionate sample. However, this study had adequate statistical power which decreased the chances of type II error.

The third limitation is related to a measure selected to assess stress. The Life Events List (LEL; Cohen, Tyrrell, & Smith, 1991) was not included in the analysis because the scale was inappropriate for the demographics of the sample. This is because questions on the LWL were related to events that were more likely to experience by older participants such as divorce and failed business. Therefore, few the undergraduate participants experienced the events included on the LCL, which yielded very low frequency counts, which in turn made it impossible to construct variables for this measure. However, a strength of this study is that a second measure of stress was included which provided an alternative measure for the current study.

Next, this study examined mindfulness but administered a measure that specifically assessed mindfulness as a trait. Moreover, participants were not asked if they have had prior experience with mindfulness-based practices such as yoga or meditation and if so, how long they had been practicing. In the future, researchers should control for prior mindfulness experiences

in their analyses. Additionally, having this added information can help us understand participants' trait mindfulness with additional research questions that aim to examine if frequency of practices is related to levels of mindfulness. Also, this study used a trait mindfulness measure but future studies may need to examine different dimensions of mindfulness (e.g., trait or state) when selecting the appropriate mindfulness scales for their study. For example, to assess state mindfulness, researchers can administer the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013). But if trait or dispositional mindfulness is the focus, then measures such as MAAS or the Toronto Mindfulness Scale (TMS; Lau et al., 2006) are applicable. Moreover, researchers should use measures that have multiple subscales to evaluates different dimensions of mindfulness such as the FFMQ, which assesses five different facets of mindfulness. Administering measures that can capture multiple dimensions of mindfulness can help us delineate the complexities of this construct.

Lastly, this study did not find a significant association between CN and PWB which is contradictory to what past researchers have found (e.g., Zhang et al., 2014). However, as CN itself is a complex construct, another way to gain understanding of participants' experiences of CN is to employ a qualitative approach. Qualitative methods afford researchers an opportunity to learn about the amount of time and the types of activities or natural environments participants engage in which contributed to their CN. Qualitative findings can help researchers understand and interpret their quantitative results as a construct such as CN requires more in-depth understanding which qualitative data can provide. As both quantitative and qualitative methods offer useful information, a mixed methods design allows the inclusion of both approaches. Researchers may consider this third methodological approach in their future studies.

Contributions

Despite these limitations, the study contributes to the literature by providing an in-depth examination of the interplay between CN, mindfulness, and distress in predicting PWB. First, this study included measures that examined specific measures PWB such as depression and anxiety in relation to CN, which has not previously been analyzed. Second, the current study went beyond correlational analyses and tested advanced statistical models which included mediation and moderation. Specifically, this study tested a model of how CN can contribute to well-being, as that association is mediated by mindfulness. Next, results from the study helps explain the process of how CN is associated to distress and PWB. This is because mindfulness has helped delineate this association between CN and well-being and distress. Particularly, the indirect effects of CN on distress and PWB is carried through mindfulness. Third, results from the moderation analyses provided support for the idea that increased mindful acceptance can potentially build up cognitive resources such as attention, which in turn, increases one's coping resources when faced with stressors.

Another fundamental contribution of this study is the conceptual model developed for this investigation. Specifically, this study tested a conceptual framework that integrated theories associated with CN, stress, and mindfulness in a single model. Furthermore, results provided correlational evidence that supports the theoretical model on how these different constructs work together in predicting PWB. Particularly, this model and the results bring attention to alternative ways in which mindfulness can be promoted such as establishing a CN through more experiences of the natural world. For future studies, researchers can test this model and extend from this current study by examining the long-term effects of CN and mindfulness on PWB over a period

of time with experimental or longitudinal designs.

References

Adler, N. E., Horowitz, M., Garcia, A., & Moyer, A. (1998). Additional validation of a scale to assess positive states of mind. *Psychosomatic Medicine,* 60(1), 26-32.

Aiken, L. S., & West, S. G. (1991). Multiple regression: Testing and interpreting interactions. Newbury Park, CA: Sage.

Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, *14*(2), 64-68.

Ando, M., Morita, T., Akechi, T., Ito, S., Tanaka, M., Ifuku, Y., & Nakayama, T. (2009). The efficacy of mindfulness-based meditation therapy on anxiety, depression, and spirituality in Japanese patients with cancer. *Journal of Palliative Medicine, 12*(12), 1091-1094.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self- report assessment methods to explore facets of mindfulness. *Assessment, 13*, 27-45.

Barbaro, N., & Pickett, S. M. (2016). Mindfully green: Examining the effect of connectedness to nature on the relationship between mindfulness and engagement in pro-environmental behavior. *Personality and Individual Differences, 93*, 137-142.

Barnes, V. A., Bauza, L. B., & Treiber, F. A. (2003). Impact of stress reduction on negative school behavior in adolescents. *Health and Quality of Life Outcomes, 1*(1), 1.

Barnes, V. A., Treiber, F. A., & Davis, H. (2001). Impact of Transcendental Meditation® on cardiovascular function at rest and during acute stress in adolescents with high normal blood pressure. *Journal of Psychosomatic Research*, *51*(4), 597-605.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, 19*(12), 1207-1212.

Berman, M. G., Kross, E., Krpan, K. M., Askren, M. K., Burson, A., Deldin, P. J., ... & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. *Journal of Affective Disorders*, *140*(3), 300-305.

Berto, R. (2005). Exposure to restorative environments helps restore attentional capacity. Journal of Environmental Psychology, 25, 249–259.

Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale: an updated literature review. *Journal of Psychosomatic Research*, *52*(2), 69-77.

Bohlmeijer, E., Prenger, R., Taal, E., & Cuijpers, P. (2010). The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *Journal of Psychosomatic Research*, *68*(6), 539-544.

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health*, *10*(1), 456.

Bränström, R., Kvillemo, P., & Moskowitz, J. T. (2012). A randomized study of the effects of mindfulness training on psychological well-being and symptoms of stress in patients treated for cancer at 6-month follow-up. *International Journal of Behavioral Medicine*, *19*(4), 535-542.

Bränström, R., Kvillemo, P., Brandberg, Y., & Moskowitz, J. T. (2010). Self-report mindfulness as a mediator of psychological well-being in a stress reduction intervention for cancer patients—A randomized study. *Annals of Behavioral Medicine*, *39*(2), 151-161.

Bringslimark, T., Hartig, T., & Patil, G. G. (2007). Psychological benefits of indoor plants in

workplaces: Putting experimental results into context. *HortScience, 42*(3), 581-587.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84*(4), 822–848.

Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance the Philadelphia mindfulness scale. *Assessment*, *15*(2), 204-223.

Carlson, L. E., Ursuliak, Z., Goodey, E., Angen, M., & Speca, M. (2001). The effects of a mindfulness meditation-based stress reduction program on mood and symptoms of stress in cancer outpatients: 6-month follow-up. *Supportive Care in Cancer*, *9*(2), 112-123.

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23-33.

Centers for Diseases Control and Prevention (CDC) (n.d). Well-Being Concepts. Retrieved from http://www.cdc.gov/hrqol/wellbeing.htm

Cervinka, R., Röderer, K., & Hefler, E. (2012). Are nature lovers happy? On various indicators of well-being and connectedness with nature. *Journal of Health Psychology*, *17*(3), 379-388.

Chawla, L. (1999). Life paths into effective environmental action. *The Journal of Environmental Education*, *31*(1), 15-26.

Chawla, L. (2007). Childhood experiences associated with care for the natural world: A theoretical framework for empirical results. *Children Youth and Environments*, *17*(4), 144-170.

Chawla, L. (2009). Growing up green: Becoming an agent of care for the natural world. *The Journal of Developmental Processes*, *4*(1), 6-23.

Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health & Place*, *28*, 1-13.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396.

Cohen, S., Tyrrell, D. A., & Smith, A. P. (1991). Psychological stress and susceptibility to the common cold. *New England Journal of Medicine*, *325*(9), 606-612.

Corraliza, J. A., Collado, S., & Bethelmy, L. (2012). Nature as a moderator of stress in urban children. *Procedia-Social and Behavioral Sciences*, *38*, 253-263.

Danucalov, M. A. D., Kozasa, E. H., Ribas, K. T., Galduróz, J. C. F., Garcia, M. C., Verreschi, I. T. N., ... & Leite, J. R. (2013). A yoga and compassion meditation program reduces stress in familial caregivers of Alzheimer's disease patients. *Evidence-Based Complementary and Alternative Medicine*, *2013*, *1-8*.

Day, M. A., Thorn, B. E., & Rubin, N. J. (2014). Mindfulness-based cognitive therapy for the treatment of headache pain: A mixed-methods analysis comparing treatment responders and treatment non-responders. *Complementary Therapies in Medicine*, *22*(2), 278-285.

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71-75.

Dijkstra, K., Pieterse, M. E., & Pruyn, A. (2008). Stress-reducing effects of indoor plants in the built healthcare environment: The mediating role of perceived attractiveness. *Preventive Medicine*, *47*(3), 279-283.

Dube, S. R., Miller, J. W., Brown, D. W., Giles, W. H., Felitti, V. J., Dong, M., & Anda, R. F. (2006). Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *Journal of Adolescent Health*, *38*(4), 444-e1.

Finlay, J., Franke, T., McKay, H., & Sims-Gould, J. (2015). Therapeutic landscapes and wellbeing in later life: Impacts of blue and green spaces for older adults. *Health & Place*, *34*, 97-106.

Fjeld, T., Veiersted, B., Sandvik, L., Riise, G., & Levy, F. (1998). The effect of indoor foliage plants on health and discomfort symptoms among office workers. *Indoor and Built Environment*, *7*(4), 204-209.

Garland, E. L., Gaylord, S. A., & Fredrickson, B. L. (2011). Positive reappraisal mediates the stress-reductive effects of mindfulness: An upward spiral process. *Mindfulness*, *2*(1), 59-67.

Garland, E., Gaylord, S., & Park, J. (2009). The role of mindfulness in positive reappraisal. *Explore: The Journal of Science and Healing*, *5*(1), 37-44.

Gobster, P. H., Nassauer, J. I., Daniel, T. C., & Fry, G. (2007). The shared landscape: what does aesthetics have to do with ecology?. *Landscape Ecology*, *22*(7), 959-972.

Grinde, B., & Patil, G. G. (2009). Biophilia: does visual contact with nature impact on health and well-being?. *International Journal of Environmental Research and Public Health*, *6*(9), 2332-2343.

Hölzel, B. K., Carmody, J., Vangel, M., Congleton, C., Yerramsetti, S. M., Gard, T., &

Horowitz M, Adler N, Kegeles S. (1988). A scale for measuring the occurrence of positive states of mind: A preliminary report. *Psychosomatic Medicine*, *50*(5), 477–483.

Horowitz, M. A. R. D. I., Adler, N., & Kegeles, S. (1988). A scale for measuring the occurrence of positive states of mind: a preliminary report. *Psychosomatic Medicine*, 50(5), 477-483.

Howell, A. J., Dopko, R. L., Passmore, H. A., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences*, *51*(2), 166-171.

Hug, S. M., Hartig, T., Hansmann, R., Seeland, K., & Hornung, R. (2009). Restorative qualities of indoor and outdoor exercise settings as predictors of exercise frequency. *Health & Place*, *15*(4), 971-980.

Jain, S., Shapiro, S. L., Swanick, S., Roesch, S. C., Mills, P. J., Bell, I., & Schwartz, G. E. (2007). A randomized controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination, and distraction. *Annals of Behavioral Medicine*, *33*(1), 11-21.

Kabat-Zinn, J. (1990). Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center.

Kabat-Zinn, J. (1992). Psychosocial factors: Their importance and management. *Prevention of Coronary Heart Disease, Little, Brown and Company, Boston*.

Kahn, P. H. (1997). Developmental psychology and the biophilia hypothesis: Children's affiliation with nature. *Developmental Review*, *17*(1), 1-61.

Kalvaitis, D., & Monhardt, R. M. (2012). The architecture of children's relationships with nature: a phenomenographic investigation seen through drawings and written narratives of elementary students. *Environmental Education Research*, *18*(2), 209-227.

Kamitsis, I., & Francis, A. J. (2013). Spirituality mediates the relationship between engagement

with nature and psychological wellbeing. *Journal of Environmental Psychology*, *36*, 136-143.

Kaplan, R. (2001). The nature of the view from home psychological benefits. *Environment and Behavior*, *33*(4), 507-542.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, *15*(3), 169-182.

Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment & Behavio*r, 33, 480–506

Kaplan, S., & Berman, M. G. (2010). Directed attention as a common resource for executive functioning and self-regulation. *Perspectives on Psychological Science*, *5*(1), 43-57.

Keyworth, C., Knopp, J., Roughley, K., Dickens, C., Bold, S., & Coventry, P. (2014). A mixed-methods pilot study of the acceptability and effectiveness of a brief meditation and mindfulness intervention for people with diabetes and coronary heart disease. *Behavioral Medicine*, *40*(2), 53-64.

King, A. P., Block, S. R., Sripada, R. K., Rauch, S., Giardino, N., Favorite, T., ... & Liberzon, I. (2016). Altered default mode network (DMN) resting state functional connectivity following a mindfulness-based exposure therapy for posttraumatic stress disorder (PTSD) in combat veterans of Afghanistan and Iraq. *Depression and Anxiety*, *33*(4), 289-299.

Krčmářová, J. (2009). EO Wilson's concept of biophilia and the environmental movement in the USA. *Klaudyán: Internet Journal of Historical Geography and Environmental History*, *6*(1/2), 4-17.

Kuo, F. E. M. (2013). Nature-deficit disorder: evidence, dosage, and treatment. *Journal of Policy*

Research in Tourism, Leisure and Events, *5*(2), 172-186.

Lazar, S. W. (2011). Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry Research: Neuroimaging,191*(1), 36-43.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing Company.

Lim, X., & Qu, L. (2017). The Effect of Single-Session Mindfulness Training on Preschool Children's Attentional Control. *Mindfulness*, *8*(2), 300-310

Loureiro, A., & Veloso, S. (2014). Outdoor Exercise, Well-Being and Connectedness to Nature. *Psico*, *45*(3), 299-304.

Mackenzie, M. J., Carlson, L. E., Munoz, M., & Speca, M. (2007). A qualitative study of self-perceived effects of mindfulness-based stress reduction (MBSR) in a psychosocial oncology setting. *Stress and Health*, *23*(1), 59-69.

Mårtensson, F., Boldemann, C., Söderström, M., Blennow, M., Englund, J. E., & Grahn, P. (2009). Outdoor environmental assessment of attention promoting settings for preschool children. *Health & Place*, *15*(4), 1149-1157.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, *24*(4), 503-515.

Mayer, F. S., Frantz, M., & Bruehlman-senecal, C. E, & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*(5), 607-645.

McCurdy, L. E., Winterbottom, K. E., Mehta, S. S., & Roberts, J. R. (2010). Using nature and

outdoor activity to improve children's health. *Current Problems in Pediatric and Adolescent Health Care, 40*(5), 102-117.

Mendelson, T., Greenberg, M. T., Dariotis, J. K., Gould, L. F., Rhoades, B. L., & Leaf, P. J. (2010). Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. *Journal of Abnormal Child Psychology*, *38*(7), 985-994.

Morone, N. E., Lynch, C. S., Greco, C. M., Tindle, H. A., & Weiner, D. K. (2008). "I felt like a new person." The effects of mindfulness meditation on older adults with chronic pain: qualitative narrative analysis of diary entries. *The Journal of Pain, 9*(9), 841-848.

Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science*, 24(5) 776–781.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies, 12*(2), 303-322.

Nyklíček, I., & Kuijpers, K. F. (2008). Effects of mindfulness-based stress reduction intervention on psychological well-being and quality of life: is increased mindfulness indeed the mechanism?. *Annals of Behavioral Medicine, 35*(3), 331-340.

O'Rand, A.M., & Hamil-Luker, J. (2005). Processes of cumulative adversity: Childhood disadvantage and increased risk of heart attack across the life course. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 60*(Special Issue 2), S117-S124.

Richardson, M., & Hallam, J. (2013). Exploring the psychological rewards of a familiar

semirural landscape: Connecting to local nature through a mindful approach. *The Humanistic Psychologist, 41*(1), 35-53.

Richardson, M., & Sheffield, D. (2015). Reflective self-attention: A more stable predictor of connection to nature than mindful attention. *Ecopsychology, 7*(3), 166-175.

Roe, J. J., Thompson, C. W., Aspinall, P. A., Brewer, M. J., Duff, E. I., Miller, D., ... & Clow, A. (2013). Green space and stress: Evidence from cortisol measures in deprived urban communities. *International Journal of Environmental Research and Public Health*, *10*(9), 4086-4103.

Roe, J., & Aspinall, P. (2011). The restorative outcomes of forest school and conventional school in young people with good and poor behaviour. *Urban Forestry & Urban Greening*, *10*(3), 205-212.

Schutte, A. R., Torquati, J. C., & Beattie, H. L. (2015). Impact of urban nature on executive functioning in early and middle childhood. *Environment and Behavior*, 1-8.

Scott, K. M., Von Korff, M., Angermeyer, M. C., Benjet, C., Bruffaerts, R., De Girolamo, G., ... & Tachimori, H. (2011). Association of childhood adversities and early-onset mental disorders with adult-onset chronic physical conditions. *Archives of General Psychiatry*, *68*(8), 838-844.

Sellers, R. M., Copeland-Linder, N., Martin, P. P., & Lewis, R. H. (2006). Racial identity matters: The relationship between racial discrimination and psychological functioning in African American adolescents. *Journal of Research on Adolescence*, *16*(2), 187-216.

Sepa, A., Wahlberg, J., Vaarala, O., Frodi, A., & Ludvigsson, J. (2005). Psychological stress may induce diabetes-related autoimmunity in infancy. *Diabetes Care*, *28*(2), 290-295.

Shapiro, S. L., Oman, D., Thoresen, C. E., Plante, T. G., & Flinders, T. (2008). Cultivating mindfulness: effects on well-being. *Journal of Clinical Psychology*, *64*(7), 840-862.

Shelov, D. V., Suchday, S., & Friedberg, J. P. (2009). A pilot study measuring the impact of yoga on the trait of mindfulness. *Behavioural and Cognitive psychotherapy*, *37*(05), 595-598.

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2013). Meditation Awareness Training (MAT) for improved psychological well-being: a qualitative examination of participant experiences. *Journal of Religion and Health*, *53*, 849-863.

Sin, N. L., Graham-Engeland, J. E., Ong, A. D., & Almeida, D. M. (2015). Affective reactivity to daily stressors is associated with elevated inflammation. *Health Psychology*, 1-12.

Song, Y., & Lindquist, R. (2015). Effects of mindfulness-based stress reduction on depression, anxiety, stress and mindfulness in Korean nursing students. *Nurse Education Today*, *35*(1), 86-90.

Stigsdotter, U. K., & Grahn, P. (2011). Stressed individuals' preferences for activities and environmental characteristics in green spaces. *Urban Forestry & Urban Greening*, *10*(4), 295-304.

Tacón, A. M., McComb, J., Caldera, Y., & Randolph, P. (2003). Mindfulness meditation, anxiety reduction, and heart disease: a pilot study. *Family & Community Health*, *26*(1), 25-33.

Tanay, G., & Bernstein, A. (2013). State Mindfulness Scale (SMS): development and initial validation. *Psychological Assessment*, *25*(4), 1286-1299.

Tang, Y. Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., ... & Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National*

Academy of Sciences, 104(43), 17152-17156.

Taylor, A. F., & Kuo, F. E. (2009). Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders, 12*(5), 402-409.

Taylor, A., & Kuo, F. E. M. (2011). Could exposure to everyday green spaces help treat ADHD? Evidence from children's play settings. *Applied Psychology: Health and Well-Being*, *3*(3), 281-303.

Tennessen, C. M., & Cimprich, B. (1995). Views to nature: Effects on attention. *Journal of Environmental Psychology*, *15*(1), 77-85.

Trigwell, J. L., Francis, A. J., & Bagot, K. L. (2014). Nature connectedness and eudaimonic well-being: Spirituality as a potential mediator. *Ecopsychology, 6*(4), 241-251.

Turner, H. A., & Butler, M. J. (2003). Direct and indirect effects of childhood adversity on depressive symptoms in young adults. *Journal of Youth and Adolescence, 32*(2), 89-103.

Ulrich, R. (1984). View through a window may influence recovery. *Science*, *224*, 224-225.

Ulrich, R. S. (1979). Visual landscapes and psychological well-being. *Landscape Research*, *4*(1), 17-23.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology, 11*(3), 201-230.

United Nations (UN) (2014). World's population increasingly urban with more than half living in urban areas. Retrieved on http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html.

United States Census Bureau (n.d.). 2010 Census Urban and Rural Classification and Urban Area Criteria. Retrieved on https://www.census.gov/geo/reference/ua/urban-rural-2010.html.

United States Census Bureau (n.d.). How many people reside in urban or rural areas for the 2010. Retrieved on https://www.census.gov/geo/reference/ua/urban-rural-2010.html.

Vadala, C. E., Bixler, R. D., & James, J. J. (2007). Childhood play and environmental interests: Panacea or snake oil?. *The Journal of Environmental Education*, *39*(1), 3-18.

Van den Berg, A. E., Maas, J., Verheij, R. A., & Groenewegen, P. P. (2010). Green space as a buffer between stressful life events and health. *Social Science & Medicine*, *70*(8), 1203-1210.

Wells, N. M., & Evans, G. W. (2003). Nearby nature a buffers of life stress among rural children. *Environment and Behavior*, *35*(3), 311-330.

Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children Youth and Environments*, *16*(1), 1-24.

White, L. S. (2012). Reducing stress in school-age girls through mindful yoga. *Journal of Pediatric Health Care*, *26*(1), 45-56.

Wilson, E. O. (1984). *Biophilia*. Harvard University Press.

Windhorst, E., & Williams, A. (2015). Growing up, naturally: The mental health legacy of early nature affiliation. *Ecopsychology*, *7*(3), 115-125.

Wolsko, C., & Lindberg, K. (2013). Experiencing connection with nature: The matrix of psychological well-being, mindfulness, and outdoor recreation. *Ecopsychology*, *5*(2), 80-91.

Zhang, J. W., Howell, R. T., & Iyer, R. (2014). Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being. *Journal of Environmental Psychology, 38,* 55-63.

TABLES

Table 1

Participant's Demographic Characteristics

Characteristics	n	%
Gender		
Female	239	86.6
Male	37	13.4
Age		
Under 18	1	0.4
18-24	252	91.3
25-34	15	5.4
35-44	4	1.4
45-54	4	1.4
Grade		
Freshman	47	17
Sophomore	59	21.4
Junior	81	29.3
Senior	86	31.2
Graduate	3	1.1
Ethnicity		
Caucasian	230	83.3
Black or African American	9	3.3
American Indian or Alaska Native	1	0.4
Asian	15	5.4
Other	31	7.6
Marital Status		
Married	15	5.4
Widowed	0	0
Divorced	3	1.1
Separated	2	0.7
Never Married	256	92.8

Depression			
	Normal	201	73.36
	Borderline	49	17.88
	Abnormal	24	8.76
	Missing Data	2	
Anxiety			
	Normal	94	34.30
	Borderline	78	28.47
	Abnormal	102	37.23
	Missing Data	2	

Table 2

Descriptive Statistics of Variables

Variables	Missing	Mean	Standard Deviation	Range	Cronbach's alpha (α)
Connection to Nature					
CTN	0	3.89	.67	1.63-5.67	.87
CN-Time	0	62.22	55.84	0-360	
Mindfulness					
Mindful Attention	1	3.57	.66	1.67-5.67	.71
Mindful Awareness	2	3.61	.51	2.30-4.90	.78
Mindful Acceptance	2	2.72	.62	1.2-4.5	.84
Distress					
PSS	2	2.10	.60	.2-40	.84
Psychological Well-being					
PSOMS	2	2.15	.55	.33-3	.81
Anxiety	2	1.31	.53	.14-2.86	.78
Depression	2	.68	.470	0-2.17	.67
SWLS	2	4.81	1.29	1.2-7	.90

Note: CTN=Connection to Nature with CN-SI; CN-Time= "*On average, how many minutes per day do you spend outdoors in an area that has natural elements such as grass, trees, and water?*"; Mindful Attention= MAAS; Mindful Awareness and Acceptance= Subscales of PHLMS; PSS= Perceived Stress Scale; PSOMS= Positive States of Mind; Anxiety and Depression =Subscales of HADS; SWLS= Satisfaction with Life Scale.

Table 3

Correlation Matrix for Connection to Nature, Mindfulness, Distress, and Well-being (N=276)

Variables	1	2	3	4	5	6	7	8	9	10
Demographics										
1. Age	---									
Connection to Nature										
2. CTN	**.21****	---								
3. CN-Time	.02	**.22****	---							
Mindfulness										
4. Mindful Attention	**.16****	**.25****	.05	---						
5. Mindful Awareness	.10	**.43****	.05	**.34****	---					
6. Mindful Acceptance	**.23****	.05	-.07	**.44****	.06	---				
Distress										
7. PSS	**-.19****	**-.15***	-.07	**-.54****	**-.18****	**-.50****	---			

Psychological Well-being											
8. Anxiety	-.10	-.06	-.02	**-.50****	-.08	**-.46****	**.70****	---			
9. Depression	.02	-.12	-.03	**-.37****	**-.23****	**-.31****	**.53****	**.58****	---		
10. PSOMS	.01	.08	.01	**.46****	**.22****	**.34****	**-.58****	**-.63****	**-.66****	---	
11. SWLS	.01	.12	.07	**.29****	**.18****	**.29****	**-.59****	**-.52****	**-.52****	**.50****	

Note: CTN=Connection to Nature with CN-SI; CN-Time= "*On average, how many minutes per day do you spend outdoors in an area that has natural elements such as grass, trees, and water?";* Mindful Attention= MAAS; Mindful Awareness and Acceptance= Subscales of PHLMS; PSS= Perceived Stress Scale; PSOMS= Positive States of Mind; Anxiety and Depression =Subscales of HADS; SWLS= Satisfaction with Life Scale; *$p < .05$; ** $p < .01$

Table 4

Mean Differences Between Females and Males Across Variables (N=276)

Variables	Mean (M)	Standard Deviation (SD)	t-test	Cohen's *d*	df	p-value
Connection to Nature						
CTN						
Females	1.00	.44	-1.10	-.20	274	.27
Males	1.10	.45				
CN-Time						
Females	62.36	55.32	-.10	-.02	274	.92
Males	61.32	59.88				
Mindfulness						
Mindful Attention						
Females	3.57	.65	.29	.051	273	.77
Males	3.60	.74				
Mindful Awareness						
Females	3.61	.51	.23	.04	272	.95
Males	3.63	.53				
Mindful Acceptance						
Females	2.72	.63	-.02	-.00	272	.56
Males	2.72	.59				
Distress						
PSS						
Females	2.12	.58	-1.25	-.22	272	.21
Males	1.99	.72				
Psychological Well-being						
PSOMS						

Females	**2.18**	.54	-2.05	-.36	272	**.04**
Males	1.98	.62				
Anxiety						
Females	1.30	.52	.30	.05	272	.77
Males	1.33	.59				
Depression						
Females	.65	.47	2.07	.37	272	**.04**
Males	**.82**	.46				
SWLS						
Females	**4.89**	1.26	-2.58	-.46	272	**.01**
Males	4.31	1.37				

Note: CTN=Connection to Nature with CN-SI; CN-Time= "*On average, how many minutes per day do you spend outdoors in an area that has natural elements such as grass, trees, and water?";* Mindful Attention= MAAS; Mindful Awareness and Acceptance= Subscales of PHLMS; PSS= Perceived Stress Scale; PSOMS= Positive States of Mind; Anxiety and Depression =Subscales of HADS; SWLS= Satisfaction with Life Scale

Table 5

Summary of Multiple Regression Analyses for Variables (Connection to Nature, Mindfulness, and Distress) Predicting Psychological Well-being (N=276)

Variable	Anxiety			Depression			PSOMS			SWLS		
	B	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*
Model 1												
Gender	-.10	.07	-.07	-.23	.07	-.17	.27	.08	.17	.76	.18	**.23***
CTN	.03	.03	.05	.02	.03	.04	-.05	.03	-.09	-.03	.07	-.02
CN-Time	.01	.02	.01	.01	.02	.01	-.01	.03	-.01	.04	.06	.03
Mindful Attention	-.10	.03	-.20	-.03	.03	-.06	.10	.03	.17	-.12	.07	-.09
Mindful Awareness	.04	.03	.08	-.06	.03	**-.13***	.06	.03	.11	.15	.07	**.11****
Mindful Acceptance	-.05	.03	-.09	-.02	.03	-.04	.01	.03	.03	.01	.07	.01
PSS	.30	.03	**.57***	.22	.03	**.47****	-.27	.03	**-.48***	-.81	.08	**-.63***
R^2	.53			.33			.41			.40		

F	42.88			18.81			25.97			25.60		
Constant	1.50			1.10			1.65			3.39		
Model 2												
PSS x CTN	.04	.02	.08	.02	.03	.05	-.04	.03	-.08	-.05	.06	-.04
PSS x Time	.02	.03	.03	.02	.03	.04	.05	.03	.08	.05	.07	.03
PSS x Mindful Attention	-.01	.03	-.01	.003	.03	.01	-.02	.03	-.03	.04	.08	.04
PSS x Mindful Awareness	-.03	.03	-.06	-.05	.03	.01	.05	.03	.09	-.01	.08	-.01
PSS x Mindful Acceptance	-.01	.03	-.02	-.07	.03	**-.15****	.05	.03	.08	.16	.08	**.13****
R^2	.54			.37			.43			.42		
$R^2\Delta$	.01			.04			.02			.02		

F	25.56	12.78	15.93	16.00
Constant	1.49	1.04	1.66	3.56

Note: CTN=Connection to Nature with CN-SI; CN-Time= *"On average, how many minutes per day do you spend outdoors in an area that has natural elements such as grass, trees, and water?"*; Mindful Attention= MAAS; Scale; Mindful Awareness and Acceptance= Subscales of PHLMS; PSS= Perceived Stress Scale; PSOMS= Positive States of Mind; Anxiety and Depression =Subscales of HADS; SWLS= Satisfaction with Life Scale; *p< .001; **p < .05; *** p <.01.

Table 6

Summary of Research Hypotheses and Level of Support

Hypotheses	Support
H1: CN will be positively correlated with life satisfaction and positive states of mind but negatively correlated with distress, anxiety, and depression.	Partial
H2: Mindfulness will be correlated with life satisfaction and positive states of mind but negatively correlated with distress, anxiety, and depression.	Partial
H3: Distress will be inversely associated with positive states of mind and life satisfaction but positively associated with depression and anxiety.	Full
H4: Mindfulness will mediate the association between CN and PWB and stress.	Partial
H5: CN will moderate the association between distress and PWB.	None
H6: Mindfulness will moderate the association between distress and PWB.	Partial

FIGURES

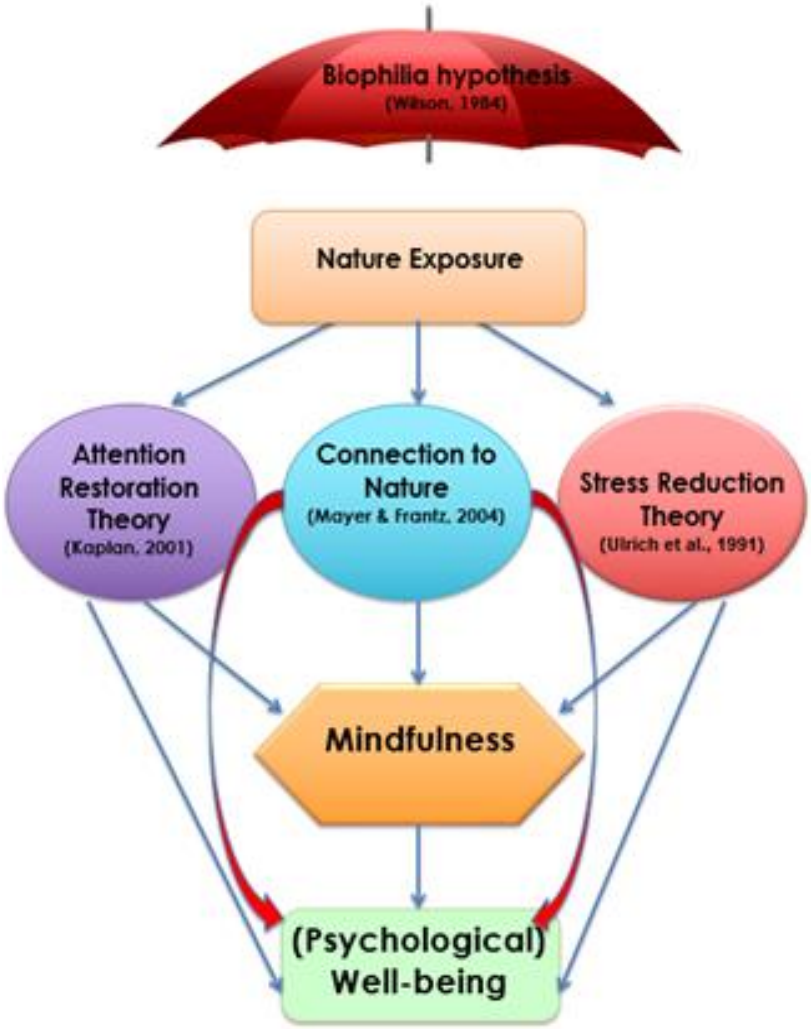

Fig. 1. Conceptual Model

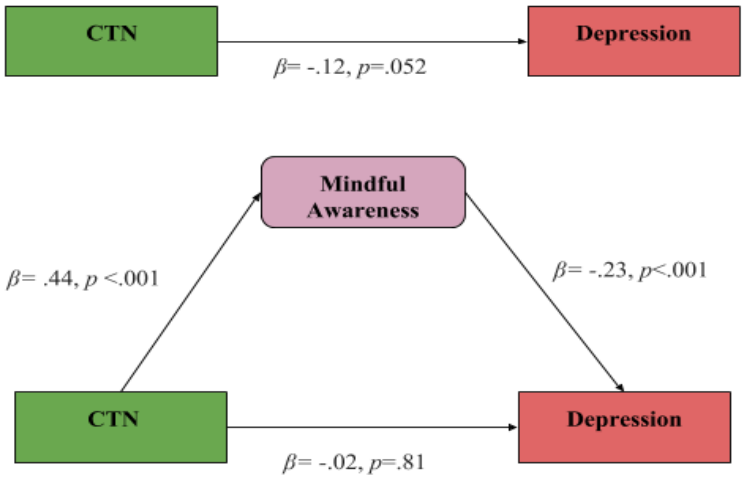

Fig. 2: Standardized regression coefficients for the association between CTN and depression as mediated by Mindful Awareness

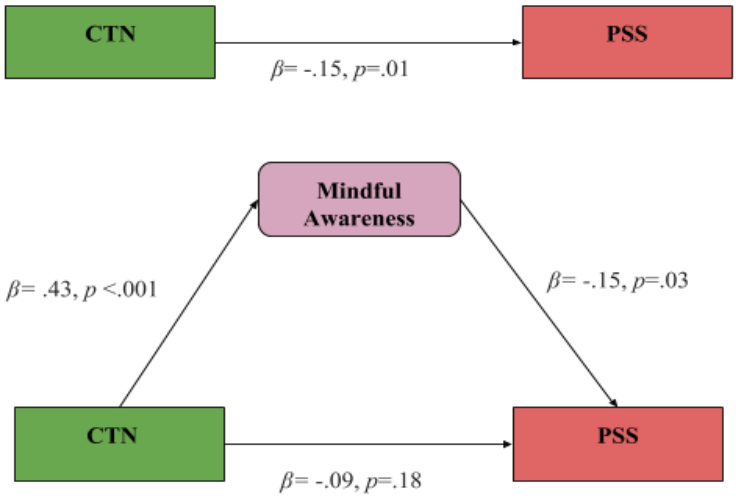

Fig. 3: Standardized regression coefficients for the association between CTN and PSS as mediated by Mindful Awareness

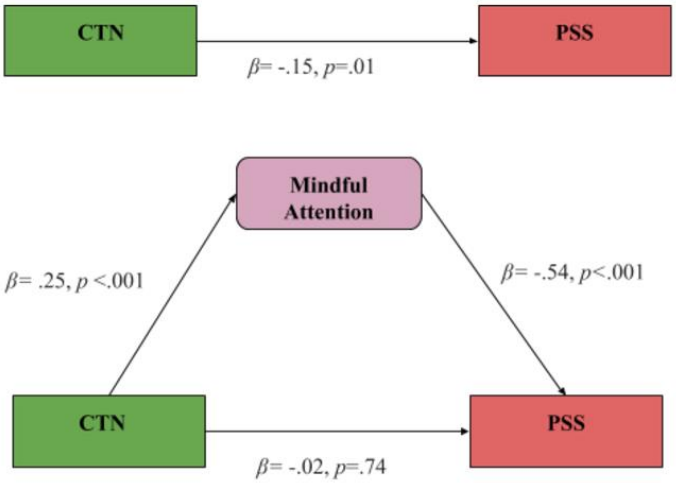

Fig. 4: Standardized regression coefficients for the association between CTN and PSS as mediated by Mindful Attention

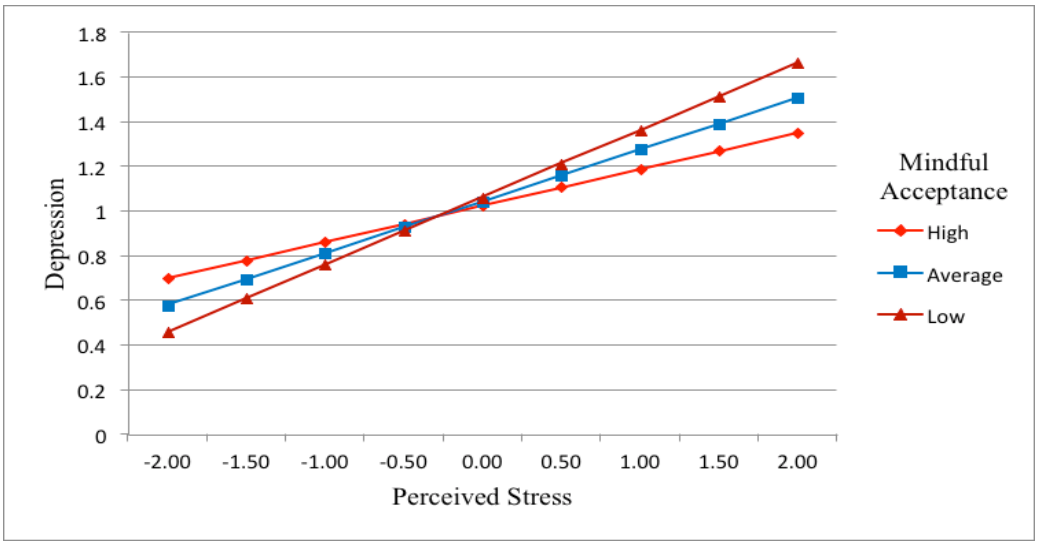

Fig. 5. Perceived Stress and Mindful Acceptance predicting Depression

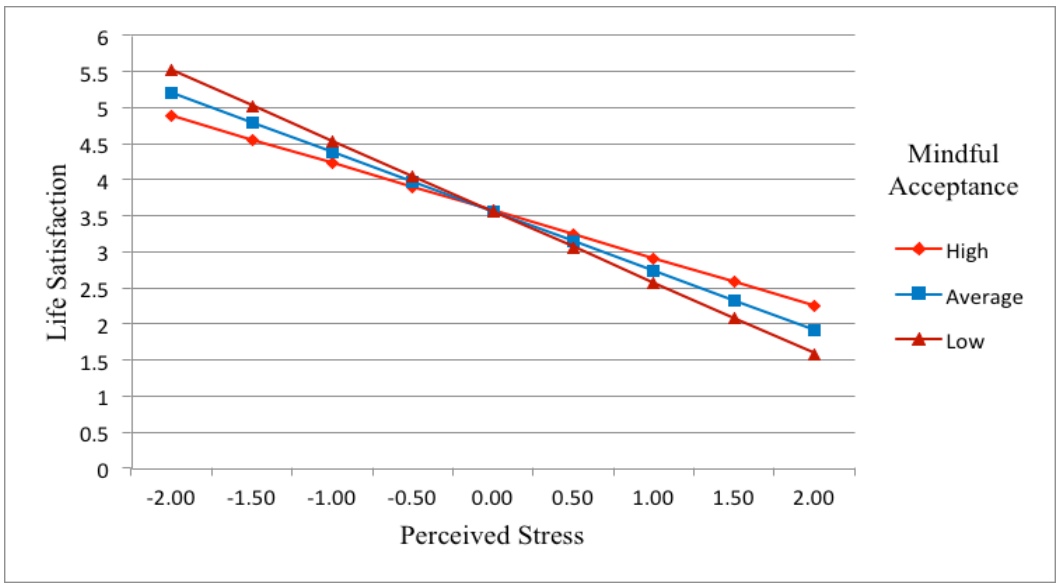

Fig. 6. Perceived Stress and Mindful Acceptance predicting Life Satisfaction

APPENDIX A: Consent

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Child, Youth and Family Studies

Informed Consent Form

Title of Research Study
Understanding the Roles of Connection to Nature, Mindfulness, and Stress Processes to Well-being

Dear Potential Participant,

My name is Tuyen Huynh and I am a graduate student at University of Nebraska-Lincoln in the College of Education and Human Sciences. I am currently recruiting participants for my Master's research study. Below you will find more detailed information of the study so you can make a decision whether you want to participate. You must be 19 years of age or older to participate.

Purpose of Research
This research project will aim to better understand how connection to nature, mindfulness, and stress are related to well-being.

Procedures
You will be asked to complete a survey online through Qualtrics that should take approximately 30 minutes to complete. Questions on the survey are geared to better understand your levels of connection with the natural world, mindfulness, and stress in relation to overall well-being. You will also be asked to provide demographic information so that we can describe the sample for this study.

Risks and Discomfort
No harm or risk is expected as a consequence of participating in this study.

Benefits
There are no direct benefits to you of participating in this research. However, knowledge gained from this project will help us to better understand how connection to nature and mindfulness are related to stress and well-being, and in the future this knowledge may be used to design interventions that could help to alleviate stress.

Compensation
There is no compensation for participating in this research.

Confidentiality
Any information obtained during this study which could identify you, will be kept strictly confidential. Any information that could potentially identify you (i.e., your name) will be removed and replaced with an identification number that cannot be connected to you in any way. Data will be stored on the researcher's computer, which is password-protected. The information obtained in this study will be reported in a master's thesis and may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data. Your identity will never be shared in any presentation or publication.

Opportunity to Ask Questions
You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may contact the investigator(s) at the phone numbers below. Please contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965 to voice concerns about the research or if you have any questions about your rights as a research participant.

Freedom to Withdraw:
Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy:
You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented.

Participation in Future Study:
At the end of the Qualtrics survey, you will be asked whether you would like to participate in our future study. If you agree, you will be asked to provide an email address where you can be contacted in the near future. Your email address will be kept on a password-protected excel sheet where this document and data will be stored on the researcher's password-protected computer and will only be accessed by the study personnel.

Signature of Participant:

_____ _____
Signature of Research Participant **Date**

Name and Phone number of investigator(s):

Tuyen Huynh, B.A. Cell: (215) 203-4500
Principal Investigator Email: huynhnhtuyen@gmail.com

Julia Torquati, Ph.D. Office: (402) 472-1674
Secondary Investigator Email: jtorquati@unl.edu

APPENDIX B: Recruitment Script

Volunteers Needed!
(IRB# 20160916503EX)

My name is Tuyen Huynh and I am a graduate student at University of Nebraska-Lincoln in the College of Education and Human Sciences. I am currently recruiting participants for my Master's research study called "*Understanding the Roles of Connection to Nature, Mindfulness, and Stress Processes to Well-being*." The purpose of this research project will aim to better understand how connection to nature, mindfulness, and stress are related to well-being.

You must be 19 years of age or older to participate. Participation is 100% voluntary with no compensation. If you choose to participate, you will be asked to complete a survey online through Qualtrics that should take approximately 30 minutes to complete. Questions on the survey are geared to better understand your levels of connection with the natural world, mindfulness, and stress in relation to overall well-being. You will also be asked to provide demographic information so that we can describe the sample for this study.

If you are interested, below is the link to Qualtrics link to the online survey.

Understanding the Roles of Connection to Nature, Mindfulness, Stress Processes in Well-being
https://unleducation.az1.qualtrics.com/SE/?SID=SV_81B8WXW9WtfE5Gl

If you are participating for extra credit in your course, but wishes to complete the Researcher's Alternative Extra Credit Assignment instead of the survey, the link is below.

Researcher's Alternative Extra Credit Assignment
https://unleducation.az1.qualtrics.com/SE/?SID=SV_5ssq84uetXcU32d

If you have any questions, please contact me through email or my cell number.

Thank you!
Tuyen Huynh

(E) huynhntuyen@gmail.com